146 U.S. 210

# RECORD, CASE No. 13,559.

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1892.

TERM No., 39.

HENRY ROOT, APPELLANT,

*vs.*

THE THIRD AVENUE RAILROAD COMPANY.

APPEAL FROM THE CIRCUIT COURT OF THE UNITED STATES FOR THE SOUTHERN DISTRICT OF NEW YORK.

FILED MAY 23, 1889.

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1 [L. S.] The President of the United States of America to Third Avenue Railroad Company, Greeting:

You are hereby commanded that you personally appear before the judges of the circuit court of the United States of America for the southern district of New York, in the second circuit court, in equity, on the first Monday of August, A. D. 1886, wherever the said court shall then be, to answer a bill of complaint exhibited against you in the said court by Henry Root, and do further and receive what the said court shall have considered in that behalf; and this you are not to omit, under the penalty on you of two hundred and fifty dollars.

Witness Honorable Melville W. Fuller, Chief Justice of the Supreme Court of the United States, at the city of New York, on the twelfth day of July, in the year one thousand eight hundred and eighty-nine, and of the Independence of the United States of America the one hundredth and eleventh.

TIMOTHY GRIFFITH, *Clerk.*

GEORGE HARDING,
*Complainant's Sol'r.*

The defendant is required to enter appearance in the above cause in the clerk's office of this court on or before the first Monday of August, 1886, or the bill will be taken *pro confesso* against —.

T. G., *Clerk.*

2 [Endorsed:] I hereby certify that on the 13th day of July, 1886, at the city of New York, in my district, I personally served the within subpœna upon the within-named Third Avenue Railroad Company by exhibiting to Lewis Lyon, the president of said company, the within original and at the same time leaving with him a copy thereof. Dated July 13th, 1886. M. T. McMahon, United States marshal, southern district of New York. U. S. circuit court. Filed July 20th, 1886. Timothy Griffith, clerk.

3 United States Circuit Court, Southern District of New York.

HENRY ROOT, Complainant,
*vs.*
THIRD AVENUE RAILROAD COMPANY, Defendant. } In Equity.

To the honorable the judges of the circuit court of the United States for the southern district of New York:

Henry Root, of San Francisco, California, a citizen of the State of California and of the United States, brings this bill against the Third Avenue Railroad Company, a corporation organized and existing under and by virtue of the laws of the State of New York, having its principal place of business in the city of New York, in the said State.

And thereupon your orator complains and says—

That your orator, the said Henry Root, before and at the time of

his application for the hereinafter-mentioned letters patent was a citizen of the United States and was the true, original, and first inventor of a certain new and useful apparatus fully described in the specifications of the letters patent hereinafter mentioned and named therein "improvement in the construction of cable rail-
4 ways," and which was not known or used in this country and was not patented or described in any printed publication in this or in any foreign country before his invention thereof, and was not in public use or on sale for more than two years prior to his application for letters patent of the United States therefor.

And your orator further shows unto your honors that on the first day of August, 1882, upon due application therefor, letters patent for said invention, numbered 262,126, were in due form of law issued and delivered to your orator, said Henry Root, in the name of the United States of America and under the seal of the Patent Office of the United States, and were signed by the Secretary of the Interior of the United States and countersigned by the Commissioner of Patents, and that the said letters patent did grant to your orator, the said Henry Root, his heirs, administrators, and assigns, for the term of seventeen years from the date thereof the exclusive right to make, use, and vend the said invention throughout the United States and territories thereof.

And your orator further shows that your orator's exclusive rights and privileges, as secured by said letters patent, have been generally acquiesced in, and that your orator has granted licenses under said letters patent and has extensively applied to practical use the inventions therein described; and your orator further shows, as he is informed and believes, the defendant corporation herein, well knowing all the facts hereinbefore set forth, has constructed and used and is now using in the southern district of New York said patented improvement or an improvement substantially the same in construction and operation as in said letters patent mentioned and described, the exclusive right to make, use, and vend which throughout the United States and the territories thereof is thus by law vested in your orator.

5 And your orator further shows that he fears and has reason to fear that unless this defendant is restrained by a writ of injunction issuing out of this court it will continue extensively to construct and use said patented improvement, and will thereby cause irreparable injury to your orator's aforesaid exclusive rights.

And so it is, may it please your honors, that the said defendant corporation, as your orator is informed and believes, without the license of your orator, against his will, and in violation of his rights, has constructed and used and intends still to continue to construct and use said patented improvement within the southern district of New York, all of which is in violation of the aforesaid letters patent.

And your orator prays that the defendant corporation herein, by a decree of this honorable court, may be compelled to account for and pay over to your orator the income and profits which it has derived from constructing and using or from the construction or use of any apparatus or improvement covered and secured by the aforesaid

letters patent, and to the end that the said defendant may be restrained from any further violation of the rights of your orator, as above set forth, your orator prays that your honors may grant a writ of injunction issuing out of and under the seal of this honorable court, directed to the said defendant herein, and strictly enjoining and restraining it, its officers, agents, and employees, from any further construction, use, or sale in any manner of said patented improvement or apparatus or any part or parts thereof in violation of the rights of your orator, and that all specimens of said improvement or apparatus or any part or parts thereof in the possession or use or under the control of said defendant may be destroyed or delivered up to your orator for that purpose, and also that your
6 honors, upon the entering of a decree for an infringement as above prayed for, may proceed to assess or cause to be assessed, under your directions, in addition to the profits to be accounted for as aforesaid, the damages your orator has sustained by reason of such infringement, and that your honors may increase the actual damages so assessed to a sum equal to three times the amount of such assessment under the circumstances of the wilful and unjust infringement by said defendant corporation, as herein set forth.

And your orator prays for a provisional or preliminary injunction and for such other relief as the equity of the case may require and to your honors may seem meet, together with the costs of this suit.

To the end, therefore, that the defendant herein may, if it can, show reasons why your orator should not have the relief herein prayed for, and that it may make a full discovery and disclosure of all the matters aforesaid, under the oath of its proper officers, and, according to the best and utmost of their knowledge, information, and belief, full, true, and perfect answer make to each of the allegations of this bill as though specially interrogated relative thereto—

May it please your honors to grant unto your orator not only a writ or writs of injunction conformable to the prayer of this bill, but also a writ of subpœna of the United States, issuing out of and under the seal of this honorable court, directed to The Third Avenue Railroad Company, the defendant herein, and commanding it to appear and answer unto this bill of complaint and to perform and abide by such order and decree as to the court shall seem meet and be required by the principles of equity and good conscience.

And your orator will ever pray.

GEORGE HARDING,
*Solicitor and Counsel for Complainant.*

7 & 8 SOUTHERN DISTRICT OF NEW YORK, } *ss.*:
*City and County of New York,* }

Henry Root, the complainant in the foregoing bill named, being duly sworn, deposes and says that he has read the foregoing bill and knows the contents thereof; that the same is true of his own knowledge except as to the matters therein stated to be alleged on information and belief, and as to those matters he believes it to be

true; and he further says that he verily believes that he was the original, true and first inventor of the new and useful improvement described in the letters patent granted to him and mentioned in the foregoing bill; and your deponent verily believes that the title of complainant as set forth in said bill is true.

HENRY ROOT.

Sworn to before me this July 9, 1886.

AUGUSTUS MERRITT,
*Notary Public, Kings County.*

(Cert. filed in N. Y. Co.)

[L. S.]

(Endorsed:) United States circuit court, southern district of New York. Henry Root, compl't, *vs.* Third Avenue Railroad Co., def't. Bill of complaint. George Harding, solicitor and counsel for compl't, 38 Park row, New York, N. Y. U. S. circuit court. Filed July 12, 1886. Timothy Griffith, clerk.

9 United States Circuit Court, Southern District of New York.

HENRY ROOT
*v.*
THIRD AVENUE RAILROAD COMPANY. } Notice of Appearance.

SIR: Please to take notice that the defendant, The Third Avenue Railroad Company, appears in this action, and that we are retained as attorney- for it therein.

Dated New York, August 2d, 1886.

Yours, &c., LAUTERBACH & SPINGARN,
*Defendant's Attorney-.*

Office address, No. 45 William street; post-office address, 45 William street, N. Y.

To George Harding, Esq, complainant's sol'r.

(Endorsed:) U. S. circuit court, so. dist. of N. Y. Henry Root *v.* 3d Ave. R. R. Co. Notice of appearance. Lauterbach & Spingarn, def't's att'y-. U. S. circuit court. Filed Aug. 2d, 1886.
10 Timothy Griffith, clerk.

11 United States Circuit Court, Southern District of New York.

HENRY ROOT
*vs.*
THIRD AVE. R. R. COMPANY. } In Equity. Nos. 3866 & 3867.

The clerk will please enter my appearance as of counsel for the defendant.

HARRY E. KNIGHT,
234 *Broadway, New York.*

(Endorsed:) U. S. circuit court. Filed Feb'y 29th, 1888. Timothy Griffith, clerk.

12 United States Circuit Court, Southern District of New York.

HENRY ROOT, Complainant,
*vs.*
THIRD AVENUE RAILROAD COMPANY, Defendant. } In Equity.

The answer of Third Avenue Railroad Company to the bill of complaint of Henry Root, complainant.

This defendant, now and at all times hereafter saving and reserving to itself all and all manner of benefit or advantage of exception that can or may be had or taken to the many errors, uncertainties, and insufficiencies in said bill of complaint contained, for answer thereto, or to so much and such parts thereof as this defendant is advised that it is material or necessary for it to make answer to, answering, says:

I. This defendant admits that letters patent of the United States No. 262,126 were granted August 1st, 1882, to Henry Root, of San Francisco, California, for an alleged improvement in the con-
13 struction of cable railways. But this defendant denies that the said letters patent are valid or of any legal force, and further denies the allegation in the bill of complaint that the said improvement was not patented or described in any printed publication in this or any foreign country before the alleged invention thereof by the aforesaid Henry Root, and was not in public use or sale for more than two years prior to the application of Henry Root for the aforesaid letters patent; but, on the contrary, this defendant avers on information and belief that the invention, improvement, or device set forth in the said letters patent No. 262,126 and particularly pointed out in the claims thereof or devices substantially, essentially, or practically the same were publicly known and in use long before and at the time of the alleged invention thereof by the said Henry Root and had been before patented and described in printed publications in this and foreign countries, as will be hereinafter specifically set forth; and, furthermore, this defendant avers on information and belief that the alleged invention set forth in said letters patent No. 262,126 had been in public and profitable use in the United States for more than two years before the date of the application of Henry Root for the aforesaid letters patent.

II. This defendant, further answering, says that it denies that the rights and privileges of the complainant assumed to be secured by the aforesaid letters patent have been generally acquiesced in, and that the complainant has extensively applied the said alleged invention therein described to practical use.

III. This defendant, further answering, avers on information and belief that the alleged invention set forth in said letters patent No. 262,126, or inventions the same in effect and substantially
14 similar in construction, were previously represented and described in the following letters patent of the United States, to wit:

No. 1262, granted July 26, 1839, to James Stimpson.
No. 51904, granted Jan. 2, 1866, to James S. Hyde.

No. 54537, granted May 8, 1866, to Chas. T. Harvey.
No. 56411, granted July 17, 1866, to Chas. T. Harvey.
No. 64862, granted May 21, 1867, to Chas. T. Harvey.
No. 66330, granted July 2, 1867, to Chas. T. Harvey.
No. 131,913, granted Oct. 1, 1872, to Abel Thompson.
No. 193,757, granted July 31, 1877, to Wm. Eppelsheimer.
No. 224,284, granted Feb. 10, 1880, to Wm. Eppelsheimer.
No. 237,814, granted Feb. 15, 1881, to Henry Casebolt.
No. 246,210, granted Aug. 23, 1881, Henry Root.
No. 246,420, granted Aug. 30, 1881, to Henry Root.
And in the following British patents, to wit:
No. 10606, old law, A. D. 1845, E. Galloway.
No. 11274, old law, A. D. 1846, T. Parkin.
No. 3133 of the year 1877, W. Eppelsheimer.
No. 4800 of the year 1878, W. Eppelsheimer.

IV. This defendant, further answering, avers on information and belief that the alleged invention or improvements assumed to be protected by the aforesaid letters patent No. 262,126 were, in all vital, essential, or important particulars, and in all respects save minor details of construction, objects of common knowledge long before their alleged invention by the said Henry Root.

15 V. This defendant, further answering, avers on information and belief that the alleged invention or improvements assumed to have been protected by the aforesaid letters patent No. 262,126, or improvements practically or substantially similar thereto, having been set forth in certain patents in foreign countries, as hereinbefore set forth, and particularly in British patents No. 3133 of the year 1877, and No. 4800 of the year 1878, to Wm. Eppelsheimer, had gone into public use in the United States under the instructions contained in such foreign patents prior to the date of the aforesaid Henry Root's application for the patent now in suit.

VI. This defendant, further answering, says that it denies that it has ever constructed or used, is constructing or using, or is intending to construct or use in the southern district of New York or elsewhere the alleged invention or improvement assumed to be protected by the aforesaid letters patent No. 262,126, or any invention or improvement substantially the same in construction or operation as that described in the said letters patent and pointed out in the claims thereof, or any improvement the exclusive right to make, use, and vend which is by law vested in the complainant; and this defendant further denies that it is constructing or using or intending to construct or use any apparatus or thing or intending to do any act in violation of the aforesaid letters patent No. 262,126 or of the just rights of any party or parties thereunder.

VII. This defendant, further answering, says that it denies every other allegation in said bill of complaint contained not hereinbefore admitted or denied.

VIII. And this defendant, further answering, says that it
16 denies that it has done or is intending to do anything contrary to equity or good conscience or tending to the injury of the complainant, and further denies that the complainant has

any right to the disclosure or accounting or to the injunction prayed for in his bill of complaint.

And this defendant, being now and at all times ready to aver, maintain, and prove, as this honorable court shall direct, all matters and things set forth in this its answer to the aforesaid bill of complaint, prays to be hence dismissed with its reasonable costs and charges in this behalf most wrongfully sustained.

THE THIRD AVENUE RAILROAD COMPANY,
By ALFRED LAZARUS, *Secretary.*
LAUTERBACH & SPINGARN,
*Solicitors for Defendants.*

Office and post-office address, 45 William St., N. Y. city.

UNITED STATES OF AMERICA, }
*City and County of New York,* } *ss:*

Alfred Lazarus, being duly sworn, doth depose and say that he is secretary of The Third Avenue Railroad Company, the defendant named in the foregoing answer signed by him; that he has read the said answer and knows the contents thereof, and that the same is true of his own knowledge except as to the matters therein stated on information and belief, and as to those matters he verily believes it to be true.

(Signed) ALFRED LAZARUS, *Secretary.*

Subscribed and sworn to before me this 15th day of November, 1886.

JOHN BROLLES,
*Notary Public* 122, *N. Y. County.*

(Endorsed:) U. S. circuit court, so. dist. of N. Y. In equity. Henry Root *vs.* The Third Avenue R. R. Co. Def't's answer. Lauterbach & Spingarn, attorneys for def't, 45 William St., N. Y. city. U. S. circuit court. Filed Nov. 15, 1886. Timothy Griffith, clerk.

17 United States Circuit Court, Southern District of New York.

HENRY ROOT, Complainant, *vs.* THIRD AVENUE RAILROAD COMPANY, Defendant. } In Equity. No. 3866.

*Amendment to Answer.*

The said defendant in the above-entitled cause hereby amends its answer by inserting in section 3 of said answer, after the 18th line of said section, the following:

No. 19736, granted March 23, 1858, to E. S. Gardner.
No. 28069, granted May 1, 1860, to Samuel T. Fowler.
No. 38112, granted April 7, 1863, to Henry Knight.
No. 101,174, granted March 22, 1870, to Charles Spear.
No. 161,222, granted March 23, 1875, to Lyman A. Gouch.

No. 182,663, granted Sept. 26, 1876, to Andrew S. Hallidie.
No. 247,781, granted October 4, 1881, to Henry Root.
No. 249,300, granted Nov. 8, 1881, to Henry Casebolt.
Also by inserting after the 22d line of said section 3 the following:
English patent No. 1854 of 1853, to Bruck.
English patent No. 1269 of 1854, to Blackburn.
18 English patent No. 2757 of 1859, to Coignet.
English patent No. 3173 of 1865, to Doull.
English patent No. 1581 of 1876, to Holt.

HOADLY, LAUTERBACH & JOHNSON,
*Solicitors for Defendant.*

New York, June 16th, 1888.

I consent to the filing of the above amendment.

GEORGE HARDING,
*Solicitor for Complainant.*

(Endorsed:) U. S. circuit court. Filed June 20th, 1888. John A. Shields, clerk.

19 Circuit Court of the United States, Southern District of New York.

HENRY ROOT, Compl't,
*vs.*
THIRD AVENUE RAILROAD COMPANY, Def't. } In Equity. 3866.

The replication of Henry Root, complainant, to the answer of The Third Avenue Railroad Company, defendant.

This repliant, saving and reserving unto himself all and all manner of advantage of exception to the manifold insufficiencies of the said answer, for replication thereunto saith that he will aver and prove his said bill to be true, certain, and sufficient in the law to be answered unto, and that the said answer of the said defendant is uncertain, untrue, and insufficient to be replied unto by this
20 repliant; without this, that any other matter or thing whatsoever in the said answer contained material or effectual in the case to be replied unto, confessed and avoided, traversed or denied, is true, all which matters and things this repliant is and will be ready to aver and prove as this honorable court shall direct, and humbly prays as in and by his said bill — hath prayed.

GEORGE HARDING,
*Sol'r for Compl't, 38 Park Row, New York City.*

Endorsed: United States circuit court, southern district of New York. Henry Root *vs.* Third Avenue Railroad Co. Replication. George Harding, sol. & of counsel for compl't. U. S. circuit court. Filed Nov. 30th, 1886. Timothy Griffith, clerk.

21 United States Circuit Court, Southern District of New York.

HENRY ROOT
*vs.*
THE THIRD AVENUE RAILROAD CO. } In Equity.

It is hereby stipulated and agreed by and between the counsel for the above-entitled parties that the testimony taken in behalf of complainants, at Philadelphia, January 4th, 1887, before R. S. Child, Jr., notary public of the State of Pennsylvania, shall have the same effect as if the said R. S. Child, Jr., had been duly appointed special examiner of the court.

(Signed) HERBERT KNIGHT.
GEORGE HARDING.

22 In the Circuit Court of the United States in and for the Southern District of New York.

HENRY ROOT
*v.*
THIRD AVENUE RAILROAD COMPANY. } In Equity.

Testimony taken before Richard S. Child, Jr., notary public, on behalf of the complainant, at 901 Walnut street, Philadelphia, January 4, 1887, at 11 a. m.

Present: George Harding, Esq., and George J. Harding, Esq., for complainant, and Herbert A. Knight, for defendant.

Counsel for complainant offers in evidence certified copy of letters patent of the United States granted Henry Root August 1, 1882, No. 262,126, and request examiner to mark same "Exhibit No. 1."

RUDOLPH M. HUNTER, a witness on behalf of the complainant, being duly sworn, deposes and says in answer to interrogatories:

23 Q. 1. What is your name, age, residence, and occupation?

A. 1. Rudolph M. Hunter; I am thirty years of age; I reside in Philadelphia, Penna.; I am a mechanical engineer and solicitor of patents.

Q. 2. Please state what experience you have had in the examination and knowledge of machinery and mechanical structures, and especially in reference to cable railways.

A. 2. I have been professionally educated as an engineer and have designed and constructed various kinds of machinery, including inclined planes and hoisting machinery employing cables. As far as I am aware I have carefully and closely examined every cable railway in this country east of California, as applied to surface and elevated railroads, as well as a large number of the inclined-plane railways. I have given considerable attention to the conduits and have made a number of inventions in cable railways and slotted conduits adapted to cable railways and have taken out a number of patents upon improvements in cable railways and conduits therefor.

I have been engaged in patent business since 1871, and from time to time have been called upon as an expert to testify in suits involving the infringements of patents. In several instances such suits involved the construction in cable railways.

Q. 3. Did you examine prior to the eighth day of July, 1886, the cable railway operated by the Third Avenue Railroad Co. in New York city, especially in reference to the construction of the slotted conduit — road-bed and method of supporting slot irons and rail? And, if so, please state the result of your examination, illustrating your answer, if you so desire, by sketches.

A. 3. Prior to the time mentioned I had made several ex-
25 aminations of the cable railway referred to during the process of construction and operation with particular reference to the construction of the slotted conduit and the road-bed generally. I have carefully watched the construction of the road-bed and the said conduit, and at that time I made a drawing illustrating the construction there used, which drawing I now produce.

(Here follows diagram marked p. 24.)

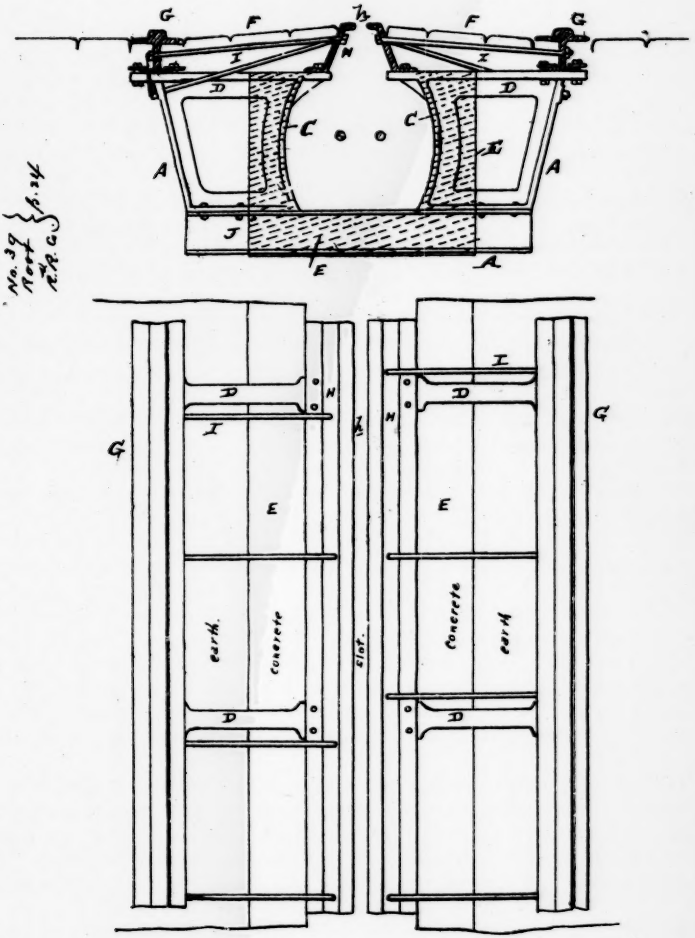
Referring to this drawing, we have the slot irons H, secured to suitable connecting ties or frames, which also support the rails G. These frames are arranged at intervals of about five (5) feet apart, and consist essentially of an I-beam base, to which are riveted two upright cast-iron brackets, having the two vertical or substantially vertical uprights A and C connected at the top by the ties D. From this it will be seen that the parts marked A, including the I beam, form a continuous or main tie supporting the two rails and extending under the conduit. The uprights marked C are essentially supports for the slot irons H which are secured to them, and the upper portion of these upright supports C is connected to the upper part of the main tie A by the tie D. For simplicity's sake these parts are made integral as far as possible. The uprights C of these frames are sufficiently separated to form the necessary width to the tube. In addition to these features, the slot irons themselves are connected with the rails and frames by additional tie-rods, I. The tube itself is formed of concrete built up between the main supporting frames, as indicated at E in the said drawing. In the upper figure of this drawing the sectioned portion indicates the cross-section of this concrete tube. It will be observed that it is open at the top to form the slotted passage-way into the conduit. This concrete is built up around the I beam (forming the bottom of the tie A) and around the upright supports for the slot iron C and a portion of the ties D, giving great stability to these portions and forming a bond and a foundation for the entire structure.

26 From this it will be seen that the structure employs connecting ties for the rails and supports for the slot irons, both of which are rigidly supported from the main ties and nailed to each other. In combination with such a structure a substructure of concrete is employed, which will set or solidify and unite the whole

U. S. Circuit Court — Complainants
Southern District of New York — Exhibit No 2.
Henry Root
Third Ave. Railroad Co. } In Equity No 3866

Notary Public

No. 39 Root } p. 34 R.R. Co.



into a continuous rigid structure, no part of which is liable to be displaced from its relation to the other.

Complainant's counsel offers the sketch referred to by the witness and requests examiner to mark it "Complainant's Exhibit No. 2."

Q. 4. Have you examined and do you understand letters patent No. 263,126, granted to Henry Root August 1, 1882, "Complainant's Exhibit No. 1"?

A. 4. I have made the examination referred to in this question and I believe I fully understand the invention therein set out and claimed. Referring to the said patent, I find it has reference to the construction of a slotted conduit and road-bed for a cable railway. I find the following words in paragraph 2, column 1, page 1:

"My invention relates to cable railways and it consists in the employment of a connecting tie for the rails and supports for the slot irons by which both are rigidly supported from the tie united to each other. In combination with these constructions I employ a substruction of concrete or equivalent material, which will set or solidify and unite the whole into a continuous rigid structure, no part of which is liable to be displaced from its relation to the other."

Near the foot of this column I find also the following words:

"In my invention the whole forms a single rigid structure."

In paragraph 3 of the specification is described the various
27 forms of construction heretofore employed in cable-railway construction and enumerates these defects, which defects are entirely overcome by the construction set out and claimed in this patent. The main ties A are described as uniting the rails G and passing under the conduit. They may be of any form desired, as is seen by the words "the ties may be of various shapes." The slot is formed by two longitudinal slot irons, which I have marked H in the patent, are supported by the upright supports C, extending upward from the main ties A, and the upper portion of these supports are connected to the upper parts of the main ties A by ties D, which, the patent says, may be fixed. These frames comprised in the parts A, C, and D are arranged at short intervals apart, and the intermediate parts between them is filled in with concrete, forming the tube with a slotted opening at the top and at the same time a bond or foundation which securely holds the ties and supports rigidly in place.

Q. 5. Please compare "Complainant's Exhibit No. 2," together with your explanation thereof, with the invention set out and claimed in complainant's patent in suit, "Complainant's Exhibit No. 1," and state whether you find in said "Exhibit No. 2" the device or devices set out and claimed in said letters patent No. 1, and state your reasons for any answer you may give.

A. 5. I have made the comparison called for in the question and find that the construction of conduit and road-bed used by the Third Avenue Railroad Company and as illustrated in my drawing, "Complainant's Exhibit No. 2," clearly embodies the invention set

out in complainant's patent, "Exhibit No. 1," and particularly set out in the 1st, 2d, 3d, 6th, and 7th claims thereof. My reasons for such opinion are: From the description of the construction of the road-bed and conduit of the Third Avenue Railroad Com-
28 pany I have shown that it embodies in a cable railway the main tie connecting the rails and the upright supports for the slot irons in combination with concrete foundations, the whole being combined in the manner and for the purpose set out in complainant's patent and particularly pointed out in the 1st claim thereof. I have also shown that the track bed of the Third Avenue Railroad Company employed track-supporting ties, A, uniting the two rails in combination with a concrete foundation, substantially in the manner and for the purpose set out in complainant's patent, and particularly pointed out in the second claim thereof. I have also shown that the two rails G were united by ties A, arranged at intervals apart, and a conduit or tube formed of concrete arranged between the rails and above the ties were used by the Third Avenue Railroad Company substantially in the manner and for the purpose set out in complainant's patent and particularly set out in the third claim thereof. I have also shown that the Third Avenue Railroad Company employed a slotted conduit and road-bed composed of rails, slot irons, and connections supported by a masonry foundation built to form the tube or a part thereof, the whole being combined in the manner and for the purpose set out in complainant's patent and particularly pointed out in the 6th claim thereof.

I have also shown that the conduit employed by the Third Avenue Railroad Company, which was adapted to receive the rope or cable, was made of concrete, open at the top, and combined with iron ribs substantially in the manner and for the purpose set out in complainant's patent and particularly pointed out in the 7th claim thereof.

For these reasons I find the construction of road-bed and conduit used by the Third Avenue Railroad Company to embody the invention as described and claimed in complainants patent, "Exhibit No. 1."

Adjourned until further notice.

29 United States Circuit Court, Southern District of New York.

HENRY ROOT, Complainant,
*v.*
THIRD AVENUE RAILROAD CO.

Testimony taken on behalf of the complainant, under the 67th rule in equity, as amended, before John A. Shields, Esq., standing examiner, at the office of George Harding, Esq., No. 38 Park row, in New York city, on December 15, 1886.

Present: George J. Harding, Esq., and Robert G. Monroe, Esq., for complainant; for defendants, Herbert Knight, Esq.

Adjourned by consent to January 4, 1887, at the office of George Harding, Esq., 901 Walnut street, Philadelphia, Pa.

30 United States Circuit Court, Southern District of New York.

HENRY ROOT
*v.*
THIRD AVENUE RAILROAD CO.

Testimony taken before John A. Shields, Esq., standing examiner of the southern district of New York, on behalf of the complainant, at the office of George Harding, Esq., 38 Park row, in New York city.

Present: George J. Harding, Esq., and R. G. Monroe, Esq., for complainant, and Herbert Knight, Esq., for defendant.

R. M. HUNTER, witness on the part of the complainant, being duly sworn, deposes and says:

Cross-examination of Mr. HUNTER by Mr. KNIGHT:

X Q. 6. In claim 7 of the patent in issue what elements, in your opinion, are embraced in the term tramway track?

A. I take it to mean the track upon which the car runs; but in this connection it is to be understood that it is to include a slotted tube or conduit suitable for cable railway.

31 X Q. 7. Do you mean to say that the term tramway track, by itself, necessarily implies and includes these other elements?

A. Yes, sir; as used in that claim it does.

X Q. 8. What are the iron ribs referred to in this claim?

A. The iron ribs are arranged at intervals apart, between which the concrete tube is formed, which ribs may extend to the rails and support them against unequal settlement.

X Q. 9. These ribs may extend to the slot irons also, may they not, and serve to support the slot irons as well as the rails?

A. They may, but claim 7 does not include the slot irons as elements.

X Q. 10. Are not the slot irons a necessary element of the tube open at the top?

A. They are not absolutely necessary, though it is advisable to use them or their equivalent.

X Q. 11. Then the slot irons are not necessarily implied as an element in this claim?

A. No, sir.

X Q. 12. Then, in that case, the iron ribs referred to only implied that they extend between and support the rails or track to prevent any difference of settlement in the different sides of the road?

A. That and also the concrete tube which is built up between the ribs.

X Q. 13. What is meant in this claim by the words "equivalent material"?

A. Some substance which must be capable of being moulded or packed into shape so as to form the tube substantially in the manner that would be carried out in making the tube of concrete.

X Q. 14. What authority have you for such a statement?

32 A. In the second paragraph of the specification I find the following words: "With this construction I employ a substratum of concrete or equivalent material which will set or solidify." This is sufficient authority.

X Q. 15. But you do not find the words "moulded or packed"?

A. Not those particular words, but the words "set and solidify" are substantially the same, and I might have used them in place of the others. The tube is certainly moulded, and even if the specification does not use that term it can hardly be considered out of place.

X Q. 16. Then the terms "set and solidify" are equivalents of "moulded or packed"?

A. To enable the concrete to set and solidify into the shape shown it must necessarily be "moulded and packed." I think they are therefore to be considered equivalents in this sense.

X Q. 17. In claim 7, then, the necessary elements are the tramway track, the tube open at the top made of concrete or equivalent material, and the iron ribs?

A. Yes, sir; when they are combined for the purpose specified.

X Q. 18. There is no particular invention in these iron ribs, is there?

A. Iron ribs or ties to connect the rails, I believe, were well known before the date of this invention by Mr. Root.

X Q. 19. Then how do you construe this claim in view of lines 92 to 97, page 1 of the specification, which read as follows: "And that concrete, brick-work, or ironstone pipe might be used to form the tube between the iron ribs of the well-known construction without any particular invention, as these materials are as well known as wood"?

A. The paragraph quoted refers to the use of narrow cast-

33 iron brackets to which the slot irons are secured and which brackets have no connection with the rails. Such was the construction at the date of Mr. Root's invention, and therefore the 7th claim comprehends the track rails of the cable railway secured to the iron ribs, which iron ribs encircle the conduit and in which the slotted conduit is formed of concrete connecting with the ribs which are embedded therein, the concrete forming essentially a support for the iron ribs, and the iron ribs in turn forming a support for the rail trackway, whereby the latter may be maintained in a fixed relation with the conduit tube, thus preventing settling.

X Q. 20. Then the term "iron ribs" in this claim means something different than the iron ribs in that portion of the specification quoted?

A. Yes, sir; they are different somewhat in their construction and function. They would take the place of those iron ribs.

X Q. 21. Can you refer to any part of the specification in Root's patent, irrespective of claim 7, which *which* would seem to indicate that when employing the words "iron ribs" he implied any such construction as indicated in your answer to cross-question 19?

A. The entire specification is a basis for the interpretation for claim 7 which I have given. It is certainly clearly shown that the

iron ribs encircled the concrete conduit, are embedded therein and extend out and support the track-bed, no part of which is liable to displacement from its relation to the other. I think the specification throughout is specific on these features. In speaking of the iron ribs in the specification, when referring to Mr. Root's invention, they are commonly spoken of as ties or frames. When speaking of previous constructions which correspond to these ties they are referred to as ribs. He acknowledges in the last paragraph of page 1 that these narrow ribs in cable railways were old, and it cer-
34 tainly could not mean such ribs in claim 7. The words "iron ribs" in this claim correspond to frames or ties.

Adjourned to 2 p. m.

X Q. 22. Then if the term iron ribs is the equivalent of the word "ties" in the other claims, it may be supposed that the word ties in the other claims cover the same and mean the same as the term iron ribs in the 7th claim?

A. Substantially so; but they may have certain limitations applied to them as to specific construction which is not included in the 7th claim.

X Q. 23. Is there any limitation such as you speak of in the 7th claim?

A. The term "iron ribs" in the 7th claim has no limitation other than that which I have already given to them—that is to say, that the iron ribs of claim 7 may be of any construction, provided they connect the rails and the slotted tube of concrete so as to maintain the rails with a fixed relation to the tube, the said ribs substantially passing around the conduit in such a manner as to not practically obstruct the passage for the grip and cable, and, furthermore, being embedded in the mass of concrete forming the tube so as to be held in a positive manner with relation to the tube.

X Q. 24. Then all that is necessary, as far as these ribs go, is to extend from one rail to the other beneath the tube so as to support the track rails and track uniformly, the ribs at the same time being embedded in the concrete or equivalent material to assist in forming an integral and continuous structure?

A. Yes, sir.

Testimony closed.

(Signed) R. M. HUNTER.

35 In the United States Circuit Court for the Southern District of New York.

HENRY ROOT, Complainant,
*vs.*
THIRD AVENUE RAILROAD CO., Respondent.

In Equity. No. 3866. Conduit Case. Deposition for Complainant in Rebuttal.

STATE OF CALIFORNIA,
*City and County of San Francisco,* } *ss.:*

Be it remembered that on this fourteenth day of April, A. D. one

thousand eight hundred and eighty-eight, before me, Holland Smith, a notary public of the State of California in and for the city and county of San Francisco, duly commissioned and sworn, at the office of William F. Booth, 220 Market street, San Francisco, California, at ten o'clock in the forenoon, personally appeared John J. Haley, Peter H. Jackson, Andrew S. Hallidie, L. B. Benehly, Henry S. Davis, and Henry Root, witnesses produced on behalf of the complainant in the above-entitled suit.

William F. Booth, Esq., appeared as counsel for complainant and J. H. Dickinson, George Pardy, Esq., appeared as counsel for respondent.

And the said witnesses having been by me first cautioned and sworn to testify the whole truth before the commencement of
36 his testimony respectively, each of said witnesses was carefully examined, and the testimony of each of said witnesses was then and there reduced to writing by me, and each deposed and said as follows—that is to say:

Col. Dickinson stated that he was engaged in court and could not be present at the examination and requested that Mr. Pardy might be allowed to propound the interrogatories on his behalf.

Examination-in-chief of JOHN J. HALEY by Mr. BOOTH:

Q. 1. Please state your name, age, residence, and occupation.

A. My name is John J. Haley; my age, 75 years; residence, the city and county of San Francisco, and occupation, real estate.

Q. 2. How long have you resided in San Francisco?

A. Thirty-six years next September.

Q. 3. Have you had anything to do with cable roads in this city; and, if so, with what road?

A. I have with the California street, Market street, Valencia street, Haight street, McAllister street, Hayes street, and Castro street.

Q. 4. Please state the circumstance of your connection with the California-street cable road.

A. I think early in 1876—it may have been the latter part of 1875—Governor Stanford asked me if I thought I could get a franchise for a wire road up California street. I said I thought I could. I went before the board of supervisors early in 1876. In the course of a few weeks I procured a franchise. Shortly after that time Governor Stanford was called to New York. He said to me to see what I could do in forming a company and having the stock taken. I first made an arrangement with the Clay Street Railroad Co. I think the arrangement was made mostly with Jos. Britton, manager for that company, verbally, terminating in their taking one-
37 half of the stock, in that agreement to allow them a certain amount for their patents. That amount was somewhere between $20,000 and $50,000; I think about $35,000. Subsequent to that—the date I do not now remember—they backed out entirely, and, after a good deal of negotiation, I agreed to give them $10,000 for the privilege of using their patents on the California-street road

Q. 5. Do you know Mr. Henry Root, the complainant in this case?

A. Yes, sir.

Q. 6. About how along have you known him?

A. I think some time in 1871 Mr. Hopkins asked me if I could get the right of way for the railroad from Oakland to Martinez. Then I became acquainted with Mr. Henry Root, who was a civil engineer, and had done something in connection with that road, and in that way I became acquainted with him.

Q. 7. What connection, if any, had Mr. Root with the California-street cable road? And please state the circumstances of such connection.

A. The governor, on leaving, left the whole matter in my hands, and I supposed it was for me to look into all parts of the construction as well as getting up the stock. For four or five years I had been among the civil engineers of the Central Pacific railroad, and in talking with Mr. Root from time to time I became satisfied in my own mind that I could recommend him to the governor as the proper man to take charge of the building of the California-street road. On Governor Stanford's return from New York but a few days could have intervened before reporting to him my progress in the California-street proposed road. In all probability I proposed Mr. Root's name as the proper person to take charge of and build the road.

Q. 8. When was that?

38 A. Well, it was in 1876, the first of September, I think—about that time. It was when Governor Stanford got home in August, and it was a few days after he got back.

Q. 9. Was your recommendation of Mr. Root accepted?

A. Yes; it was accepted; but the governor is very slow. It was thought over for perhaps two or three weeks, perhaps every day, when he asked me to bring Mr. Root in to see him. The next meeting that I had with him, a day or two afterwards, he said he had concluded that Mr. Root was the proper man—after he had inquired of his chief engineer and investigated him, I suppose.

Q. 10. Did you ever have any conversation or conversations with Mr. Root relative to the mode of construction which he (Mr. Root) proposed to adopt in building the conduit and roadway of the California-street cable road? And, if so, state what those conversations were and when they occurred as near as you can recollect.

A. From the time I spoke to Mr. Root about the matter, in the early part of 1876, Mr. Root was in my office, I think, every morning giving his views and suggestions and improvements on the Clay-street road, and laying those suggestions before me, etc., and on the governor's arrival I had digested the whole matter as to building the California-street road. This occurred between the time the governor left and his return home, which, I think, was about three months.

Q. 11. Did Mr. Root tell you how he proposed to build the conduit and roadway of the California-street road?

A. Yes, sir; every part of it was discussed.

Q. 12. How did he say that he proposed to build it?

A. Two principal points that he had as to improvements on the Clay-street road were, 1st, the grip. I was very much favorably im-

pressed with the Clay-street grip and mode of the screw. Mr.
39 Root advocated the lever. On the construction of the road-bed the Clay-street was all wood, and we had much talk as to what could take the place of the wood and have the permanency. It terminated in having ribs made of old railroad rail and Portland cement or concrete. After drawing it out and showing me by illustrations I was satisfied that it would be a great improvement. They were very fearful it would cost too much.

Q. 13. Who drew it out and showed you?

A. Mr. Root.

Q. 14. Now, Mr. Haley, I want you to try and fix as near as you can the earliest date at which Mr. Root thus explained to you, or explained to you in any manner, the way in which he proposed to build the conduit and roadway, as you have just mentioned.

A. This all occurred before the 1st September, 1876, because we were both agreeing on this before the governor's return.

Q. 15. (Office copy of letters patent of the United States No. 262,126, dated August 1, 1882, and issued to Henry Root, shown the witness.) Mr. Haley, please look at that patent, and especially at the drawings, and state whether or not that resembles what Mr. Root explained to you at the time above referred to.

A. Fig. 2 represents this, but it was a rough drawing upon my desk; but it represented the bent railroad rails holding up the channel irons and the rails for the California-street road. Then he would say to me, it would set on concrete and fill up these spaces outside of the channel for the rope and for these to rest on. The channel iron and the rail was to rest on the ribs or yokes and the yokes rested on concrete.

Q. 16. Did you ever see a model of this construction? And, if so, state when and where and the circumstances of the matter.

A. After the governor, Stanford, appointed Mr. Root the
40 superintendent and engineer and builder of the California-street road, it was suggested by Mr. Root or myself to make a complete model, as near as could be, and bring it to the governor to examine. This was done and placed in the yard at corner of Fourth and Townsend streets, in the city.

Q. 17. What did this model represent?

A. A section six or eight feet long of the mode of constructing the California-street road.

Q. 18. Look again at the drawings of the letters patent heretofore shown you and state if said drawings represent the thing shown by that model section.

A. Fig. 1 shows the model or pattern of the part of the section we had in the yard at Fourth and Townsend streets. Probably that part there (showing) was not there at all. I have reference to the pulley.

Q. 19. Who brought that model to the yard?

A. I don't know; Mr. Root told me he had the model in the yard and to go down and look at it, which I did.

Q. 20. When did you first see it?

A. Well, it was between the middle of September and middle of October, 1876. I cannot tell; it was as soon as it was made.

Q. 21. Do you know Mr. Wm. Eppelsheimer?

A. Yes, sir.

Q. 22. Now, Mr. Haley, referring to the time, which you say was shortly before the return of Gov. Stanford in August, 1876, when Mr. Root explained to you the mode of construction referred to, I will ask you whether Mr. Eppelsheimer was present.

A. He was not.

Q. 23. Do you know where Mr. Eppelsheimer was at that time?

A. I think he was in Europe or on his way to San Francisco. I will explain this why I have no doubt of it. I associated two or three gentlemen with me for the purpose of procuring signa-
41 tures to stock for the road; one of them immediately recommended Mr. Eppelsheimer, who built the Clay-street road, as he told me, and that he was in Europe, and I said to him Governor Stanford was not here, and better let that alone until he came here. Shortly after that I was informed they had sent for Mr. Eppelsheimer, anyway. I did not make any remark about it, but as far as I was concerned I had selected Mr. Root. In due time Mr. Eppelsheimer came to my office repeatedly, and at one time of his coming there I took him down and showed him this section in the yard.

Cross-examination by Mr. PARDY:

X Q. 24. Mr. Haley, you say you had a conversation with Mr. Root in your office, at which time he described to you certain modes of construction that he proposed for the California-street road, this construction taking place before the 1st September. Do you remember giving testimony in an interference case before the Patent Office between Henry Root and Wm. Eppelsheimer, the testimony in which case was taken in 1882?

A. Yes, sir; I remember there was a meeting and I was a witness in San Francisco.

X Q. 25. I will now read to you a question and answer taken from your testimony, as follows: "Q. 5. What, if anything, did Mr. Root suggest at the time of that examination (Sept. 2, 1876, answer 4) relative to the construction of the road and tube?" That was the question. Now, your answer was: "That I could not say particularly. I only know he was opposed to the manner and mode of that structure (*i. e.*, Clay-street road). At some time, a little before or a day or two after that meeting, Root described to me the mode of the construction of the tube, which was as follows:
42 He would build with railroad iron as the ribs, and concrete with Portland cement. I am quite positive that at the first meeting he had with Gov. Stanford a rough drawing of this Exhibit A was submitted by Mr. Root and very shortly afterwards considered adopted, and, from the governor's conversation with me, we felt satisfied the road would be built after that plan. Shortly after that time Governor Stanford, Mr. Root, and myself went to Mr. Hallidie

to examine a tube he had made of cast iron as a sample, which was not approved of."

How do you reconcile this testimony as to the date of 2d September, upon which you first obtained a description of Mr. Root's tube construction, and your testimony given in this examination as to the date being prior to that?

A. I said in that interference case it was the 2d September or a few days subsequent or previous. My memory then, perhaps, might have been more minute (six years ago) than it is now, as I go upon the same knowledge then as I do now—memory.

X Q. 26. Then you cannot positively state the date upon which Mr. Root divulged to you his alleged plan of tube construction?

A. In both of my testimonies I can be but a very few days from the date, which I think must have been, if not the 2d, previous to the 2d of September.

X Q. 27. Do you remember positively that the conversation in regard to the construction of the tube you had with Mr. Root occurred at the meeting of the directors of the California-street road had at the engine-house of the Clay-street road?

A. We talked about that for three months, certain—for some mode of making a permanent construction of the California-street road.

X Q. 28 You state that you saw the model of the road-bed
43 constructed by Mr. Root and exhibited at Fourth and Townsend streets some time in September or October, 1876?

A. That is my impression; it might have been some time afterwards. It is some twelve years ago.

X Q. 29. I will now read you another answer you gave in the before-mentioned interference proceedings:

"A. 6. I recollect that Mr. Root and I talked about this concrete tube, an experimental section of it, and I talked with the governor about it, and what the probable cost would be, and Governor Stanford then thought that Mr. Root had better have it made, and it was constructed and brought into the yard of the railroad company, corner Fourth and Townsend streets, a day or two before Christmas, 1876. On Christmas day of that year I brought several gentlemen to the yard to see the tube. I think it was Christmas day, for I was away on New Year's day, or it may have been between Christmas day and the 1st of January, 1877."

I now ask you to please explain which of these dates upon which you first saw this model is the correct one.

A. I have no doubt that the previous testimony is correct. That was six years ago; now it is twelve. When we have anything that costs money to carry out we lay it before the principal and have his assent to carry out the project contemplated.

X Q. 30. Can you state about the time Eppelsheimer returned from Europe?

A. I have no doubt now it was later than my memory was putting it. I thought it was in the beginning of the fall, but it could not have been so.

X Q. 31. I will now read you, from the same examination in the interference case, question and answer 16:

"Did he (Eppelsheimer) call to see you many times during the year 1876?

44 "A. In October, 1876, he called at my office two or three or four times."

Is this testimony given at the interference examination correct or not?

A. To the best of my memory, it is.

X Q. 32. Well, then, you are not prepared to say that Eppelsheimer was not here some time before the model you have spoken of was constructed?

A. Well, Mr. Eppelsheimer, when he first arrived from Europe, as he said, he came to my office a number of times, and after that he came there at times for a good while, casually. I suppose I had some data then, when my previous testimony was given, leading me to believe that he arrived here in October, but I don't remember what that circumstance was that led me to believe that he arrived here in October.

X Q. 33. You say you took Mr. Eppelsheimer down into the yard at Fourth and Townsend and showed him the model. Were you not aware that Mr. Eppelsheimer had actually taken part in the construction of that model before it came to Fourth and Townsend streets?

A. No, sir; I was not; and if he had I should certainly have known it. I never knew that he had any kind of business in the construction or anything that was used in that road. If he did it was unknown to me.

X Q. 34. Do you know where that model was made?

A. Mr. Root told me he was making it at the Potrero, at Mr. Hanscom's, the Hope foundry.

X Q. 35. Were you given any opportunity to watch the actual construction of that model?

A. No, sir.

X Q. 36. Then you knew nothing, of your own knowledge, of its construction until it was brought to Fourth and Townsend streets?

A. No; only that I assented to Mr. Root's having it made. But I never saw it until it was brought into the yard, to the best of my recollection.

45 X Q. 37. Then how is it that you are so positive that Mr. Eppelsheimer had no part in its construction?

A. For the best reason in the world: that he had no part in any part of its construction. I had no conversation with him about it or any other part of the machinery.

X Q. 38. Could not Mr. Eppelsheimer have made suggestions in regard to its construction without your being informed upon that point?

A. No; for the best reason: he was not in the country when the plan was shown to me, as well as I should certainly have been informed by Mr. Root or Mr. Eppelsheimer if he had been about there at that time; but I never spoke to any one in relation to what

we were doing except to Governor Stanford until all the arrangements were made.

X Q. 39. You say Mr. Eppelsheimer was not in the country when the plan was shown to you. What plan have you reference to?

A. The plan of the drawing of the iron and concrete for tube.

X Q. 40. Was that a finished plan or merely a sketch?

A. It was merely a rough sketch of the tube, explaining what it should be made of.

X Q. 41. Were all the details, proportions, methods of arrangement, and shapes of the parts shown in that sketch in such a way that a mechanic could produce from the sketch, without any further assistance or instructions, the model as you saw it?

A. Yes; there was the railroad iron marked out and the channel irons. Any one could have made a model from that drawing.

X Q. 42. How was the concrete arranged in that sketch—how was it disposed in relation to the iron-work?

A. Well, he said that the parts that were not in use were
43 filled up with concrete, and that the structure was supported by concrete—that is, that it was a concrete foundation; the structure itself set on a concrete foundation.

X Q. 43. You are not a mechanic, are you, Mr. Haley?

A. No; but my mind leads me to accept or reject machinery or structure generally quite accurate.

X Q. 44. Well, you are not used to examine drawings and criticising them in a professional way?

A. No; I am not; but when they are right I generally know it.

X Q. 45. You say Fig. 2 represents the sketch that Mr. Root made, and that Fig. 1 represents the model in the yard; then I understand you to distinguish between Fig. 2 and Fig. 1. Is that so?

A. Well, because that (showing) has the rails there and this (showing) has not got the rails, and the Fig. 2 has a good deal on the right-hand side that was not drawn out on the original plan; the cross-bars, etc.; these vertical hatching lines were not drawn out, only explained.

X Q. 46. Then to make the model from the sketch, which you state was incomplete, there would have to go with it an explanation as to the disposition of the concrete. Do I understand you to say so?

A. No; I don't, because Mr. Root might have put it there himself; it was there when it came in; probably when he made the drawing for the foundry he made it complete.

(Signed) JNO. J. HALEY.

At this stage adjournment was taken until Monday, April 16, 1888, at the same place, at 10 o'clock a. m.

SAN FRANCISCO, CALIFORNIA, *April* 16, 1888.

Met pursuant to adjournment.

Present: Wm. F. Booth, Esq., of counsel for complainant;

47 George Pardy, Esq., of counsel for respondent, and the witness, Peter H. Jackson, whose examination was had as follows, viz:

Examination-in-chief of PETER H. JACKSON by Mr. BOOTH:

Q. 1. Please state your name, age, residence, and occupation.

A. My name is Peter H. Jackson; my age 58 years; residence, Oakland, but do business at northwest corner Fremont and Mission streets, San Francisco; and occupation, civil engineer.

Q. 2. What experience have you had in your profession and over what length of time has it extended?

A. From 1870 to 1875 I was chief of the bureau of iron construction of the building department of New York; part of which time I was expert. From 1875 I have been engaged in civil-engineering pursuits—since I have been in San Francisco up to this time. My duties in New York were to supervise the building construction of iron. I also examined for the building department of the elevated railway on Greenwich street and Ninth avenue.

Q. 3. What experience have you had, particularly with relation to constructions in which iron and concrete are combined?

A. I have had, during these last eight years, considerable experience resulting from experiments principally in the application of iron and concrete, the iron resisting the tensile strain and the concrete resisting the compressive force. Portland-cement concrete possesses great power of resistance to compressive force, but is comparatively very weak in resisting tensile strain. The application of the metal in most of these experiments was in the part of the concrete that had to resist tensile strain, to strengthen it in that part, thereby, when the concrete body was subjected to transverse strains,
48 the object was that the concrete body would be balanced in its tensile resistance as well as in its compressive resistance.

The result of these experiments, to the best of my recollection, has resulted in about eight United States patents.

Q. 4. Were these patents taken by yourself?

A. Yes, sir.

Q. 5. To what do they generally relate?

A. To artificial-stone sidewalks that cover vaults; artificial stone in this case is called concrete, artificial stone and concrete being the same; concrete girders and beams, concrete floors and walls, the application to floors and bridges by which not only sustaining beams, but metal beams and girders are dispensed with.

By these applications only the equivalent for the bottom flange of the beam or girder is employed in resisting tensile strain, the concrete body taking the place of the web and top flange of the beam or girder, the concrete resisting the compressive force.

By this construction the body to be supported aids in about two-thirds in its own support.

Q. 6. Have you read and do you fully understand letters patent of the United States No. 262,126, dated August 1, 1882, issued to Henry Root?

A. Yes, sir.

Q. 7. State what you find in that patent, particularly with regard to iron being combined with concrete—I mean, state briefly the general construction.

A. It consists of metallic ties, which support the tube irons and holds the track—I mean slot irons—which holds them in their relative positions to each other.

In combination with this construction is employed a substratum of concrete in which these metallic ties are built and held in bond and supports the ties and partially the track between the ties.

49 In this concrete is formed a deep furrow or groove in which passes the cable and the bottom part of the grip, the concrete holding on its surface the roadway bed. The bottom of the concrete is sustained upon the earth.

Q. 8. In your opinion would such a construction as you have described and which you find in that patent call for an extended trial or experiment for testing its durability and general practical character? If so, give the reason upon which you base your opinion.

(Objected to by counsel for respondent on the ground that it is not competent to take expert testimony at this time and place, no notice having been given that such testimony would be taken, and that it is incompetent to give such testimony outside the jurisdiction of the court.)

A. I should consider such a construction would require long trial as to its durability and permanency for the following reasons:

First. The ties are like two extended levers in one piece or like two arms joined to a body. They are in an oblique form, neither parallel nor horizontal. At the extremity of the ties are placed the rails upon which the wheels of the train passes over. The force applied is sudden or called transverse impact. The tendency of the ties, unsupported, is to straighten or incline to a horizontal shape.

The resistance or support of the ties to prevent their straightening is the concrete bed on which they rest, producing tensile strain upon the top part of the furrow or tube, tending it to separate it in that part; between the ties rests the rail on the top of the concrete body, which partially supports the rail in that part, the transverse impact or suddenly applied load by the train rolling over that part—I mean the part between the ties; also a shock produced by a

50 brake at that place, which, from its formation, lifts the car and supports its weight. This produces a very severe shock at that place and causes deflection of the rail in proportion to the resistance of the concrete under it. In time these vibrations or oscillations produced upon the rail wears into the concrete on which it rests, causing deflection of the rail between the ties, which, after a great length of time, would appear to wear a deep groove in these places.

The deflection of this part of the rail draws together the ties on each side, which, in a great length of time, would seem to wear them loose and unstable—I mean in the concrete bond in which ties are built in and held. This is the employment longitudinally over the construction.

Second. Transversely considered, the force applied is at the extremity of the ties and on the top surface near the outside of the concrete body, which would be the places that would tend to separate the concrete at the top of the tube or furrow. The bottom of the tube is the part subjected to tensile strain or the part directly below the slot irons, and is a weak part of the concrete.

In General Gilmore's work on artificial stone and concrete he states that the tensile resistance to the compressive resistance of concrete composed of one volume of Portland cement to form volume of sand nine months old is from 24 to 1 to 29 to 1; therefore the force applied by a train rolling over the extremity of the ties and the concrete beneath the rails between the ties is like that of a force applied at two ends of a lever to break or cause to separate the concrete at the bottom of the tube. The concrete construction itself would seem faulty by reason of a large body of concrete on each side of the tube and a thin part of the concrete between the tube and the earth.

51 The concrete, in solidifying from its semi-plastic state, contracts. The heavy body of concrete at the extremity of the tube draws away from the thin part of the tube at its bottom, which aggregates to itself, causing weakness in tensile strain at the top of the tube and makes it liable to break at that place at which concrete is so feeble to resist. It is true that the concrete lies upon a bed of earth, but the vibrations or oscillations produced by the passage of the train and application of the brake is such as to cause the sands to shift in the earth-bed. To this is to be added the passage of streams of water during great rains rushing down an inclined road-bed.

Q. 9. What effect would the different degrees of expansibility possessed by the concrete and by the iron work have upon this subject, if any? I mean by this that if the concrete has one degree of expansibility and the iron has another, what effect would this fact have in calling for experiment or trial?

A. That result would have to be obtained by trial; the concrete would yield before the iron.

Q. 10. What result, with regard to stability, would be produced by this?

A. By long and protracted experiment, the result of the forces in slow destruction of the parts aggregates and requires long experiments to ascertain as to its durability. The statements that I have herein made is the result of long years of study and practical experiment in the direction of the application of iron to concrete bodies, and these points are such as can only be cleared away by long experiment extending over a great length of time. If we go beyond to a very slight degree of the elastic force of the concrete or iron, the slow destruction aggregates and the result is final rupture.

Q. 11. I will read to you the following quotation from the
52 testimony of John Bogart, a witness produced on the part of the respondent in this case: "I consider that, within the period of six months at the longest, a positive conclusion would be

arrived at as to whether the structure referred to would or would not be suitable for the purpose for which it was constructed."

This quotation is taken from the answer to question 8 of that witness, and the structure mentioned therein is that shown by the Root patent in suit.

I will now ask you whether or not you coincide with this view as to the period of time it would take to arrive at a positive conclusion.

A. I do not coincide.

Q. 12. What, in your opinion, would be a reasonable time before which a positive conclusion could be arrived at?

A. I have given this question—revolved it in my own mind—considerable consideration during my examination of the Root patent, and I have concluded that I could answer best in this wise:

If I or any of my friends were about to take a pecuniary interest at the inception of the building of the road, I would not of myself nor would I advise my friends to take any interest until it had been in practical operation for four years. Further, the aggregate of these destructive forces which I have heretofore stated are so slow that a great length of time must elapse as to the time of its practical working.

Cross-examination by Mr. PARDY:

X Q. 13. Mr. Jackson, have you had any practical experience with regard to the operation of cable railways constructed with iron and concrete combined for the subway?

A. No, sir.

X Q. 14. Then all that you have stated as an expert in your testimony above given is based upon theory alone. Are we to understand so?

53 A. My testimony given is the result of theory and practical experiment in the application of iron to concrete, in which the concrete bonds the iron, and the iron has been employed to resist compressive force as well as tensile strain. I have also experimented in this combination in resisting steady loads and suddenly applied loads or weights.

X Q. 15. Suppose, Mr. Jackson, you were called upon to examine the California Street Railroad substructure at the end of one year's constant public use, and you found at that time there had been no deterioration in any substantial degree, what opinion would you form as to its lasting quality?

A. I could not determine for that length of time, because the presence of a gradual destroying force might not, and probably would not, be apparent under the time that I have heretofore given for its ultimate destruction, as the destroying forces are gradual in their results.

X Q. 16. The durability of the structure would not be affected in a disastrous way purely by the lapse of time, would it?

A. It is the aggregate of vibrations and shocks that ultimate in final rupture, and it takes a certain amount of time for that result, and what that is in my opinion I have already stated.

X Q. 17. Supposing that the road lay idle and nothing passed over it, would you expect it to deteriorate in a disastrous way from year to year?

A. That might be; from the rushing of a body of water occasioned by storms that might undermine the foundations.

X Q. 18. But there would be no other element of destruction, would there? If so, state what.

A. As I have stated in my testimony that large bodies of concrete on each side of the tube in its contraction draws to
54 itself at the expense of separation at the thin part of the tube at the earth-bed; during this lapse of time, notwithstanding the road is unemployed, it is deteriorating in strength to what it would be considered to be providing this subject was not considered when the road was unemployed.

X Q. 19. What is it that draws the concrete together as you say—differences in temperatures occurring, or is it something else?

A. Concrete when exposed to the elements contract- by nature's laws, and also in some degree expands. As an evidence of this fact we have only to observe the concrete sidewalks in the various streets in this city that are cracked, caused by contraction.

X Q. 20. (Repeated.)

A. Chemical action. Concrete in the tube is the same as concrete in other applications, and the nature is to contract when exposed to the elements, caused by chemical action.

X Q. 21. Then, I understand you to make your deductions as to the durability of the tube of the California-street railroad largely from your experience with sidewalks?

A. No, sir; it is from observation and some degree experience.

X Q. 22. If the deterioration of the subway of a cable road composed of concrete and iron is largely effected by shock—by the shocks incident to travel upon the surface—would you not be able to detect that in any shorter period than four years?

A. Possibly.

X Q. 23. Do you not know actually that it would be detected?

A. Resulting from a number of years in study and experience in testing and experimenting, my final conclusion is that no satisfactory result could be obtained in less than four years' experiment, based on my present knowledge, without any practical experiment.

55 X Q. 24. If the shock of travel upon such a road-bed injured it in disastrous degree would or would it not be detected in less than four years?

A. Oh, yes; if it was observed it had been disastrously affected inside of four years.

X Q. 25. Then if the road showed no deterioration whatever in, say, from one to two years after it had stood the heaviest traffic that it would likely be subjected to, would you not, as an engineer, conclude that the structure would last?

A. No.

(Signed) PETER H. JACKSON.

Recess until 2.30 p. m.

Examination-in-chief of ANDREW S. HALLIDIE by Mr. BOOTH:

Q. 1. Please state your name, age, residence, and occupation.

A. My name is Andrew S. Hallidie; my age, 50 years and upwards; residence, city and county of San Francisco, and occupation, the president of the California wire works.

Q. 2. Are you the Mr. Hallidie who constructed the cable road on Clay street, in this city?

A. Yes.

Q. 3. Do you know Mr. Root, the complainant; and, if so, about how long?

A. Yes; about fourteen years.

Q. 4. I now show you office copy of letters patent of the United States No. 262,126, August 1, 1882, issued to Henry Root, and I ask you whether you recognize and understand the invention there shown.

A. Yes.

Q. 5. When and under what circumstances did you first acquire a knowledge of that invention?

56 A. I think about 1876. In 1876, in the fall, the month of September, I had an interview with several gentlemen in the office of the Clay-street railroad in relation to the construction of a cable road on California street, in which Governor Stanford, Charles Crocker, Mr. Britton, myself, and others were interested, and during that interview the question of the construction of the road-bed came up; several modes of construction were discussed.

(Counsel for respondent makes objection to the witness stating the matters discussed at that interview, except as to such matters as were talked of in his personal presence and hearing.)

Among them the form of construction as described in the patent No. 262,162, submitted by Mr. Root.

Q. 6. Have you any means of fixing the date of that meeting?

A. Yes; I find in my memorandum book it occurred on the 2d day of September, 1876.

Q. 7. Who were present at that interview?

A. Mr. S. S. Montague, Gov. Stanford, Henry L. Davis, Henry Root, C. H. Canavan, Jos. Britton, and some others I don't think of now.

Q. 8. You say that Mr. Root submitted the plan of construction as shown in his patent. To whom did he submit it?

A. To the gentlemen present.

Q. 9. Did he explain it to you?

A. Yes.

Q. 10. How did he explain it?

A. He explained it in a general way, more particularly emphasizing the combination of the iron with the concrete, claiming that it made a compact and homogeneous tube.

Q. 11. Did you know Mr. Wm. Eppelsheimer?

A. Yes.

57 Q. 12. Was he present at that interview or meeting to which you have above alluded?

A. No.

Q. 13. What knowledge of this invention as shown in the Root patent, 262,126, did you ever gain from Mr. Wm. Eppelsheimer?

A. None.

Q. 14. Mr. Hallidie, what is your profession?

A. Civil and mechanical engineer.

Q. 15. How long have you been an engineer? And please state what experience you have had in regard to the inception and construction of cable railways.

A. I have been an engineer since I was eighteen years of age, and connected with cable railroads since 1869.

Q. 16. What did you do in 1869 with regard to this subject?

A. In 1869 I matured a system of elevated ropeways for the transportation of ore, and continuing my investigation in that line I matured a system of cable railroads now used in San Francisco and elsewhere, and in 1873 I constructed the Clay-street railroad.

Q. 17. Did you have any connection with the California-street cable railroad?

A. Yes; I was one of its directors and vice-president.

Q. 18. Do you know how the several cable railways of this city are constructed?

A. Yes; in a general way.

Q. 19. In 1876, when the mode of construction which Mr. Root proposed for the California-street cable road was submitted, what opinion had you of it?

A. At that time I did not approve of it.

Q. 20. From your knowledge and experience as a civil and mechanical engineer, and from your experience of cable roads, I will ask you whether, in your opinion, the construction shown in the Root patent, 262,126, called for an extended experiment or

58 trial to test its durability and general practical character. In answering this question please take into account the state of the art in cable railways as it existed in 1878.

(Objected to on the ground that it is an attempt to introduce expert testimony, no notice having been given that such testimony would be taken at this time and place, and that it is incompetent to introduce it outside of the jurisdiction of the trial court.)

A. My opinion at that time was that it was an untried experiment, and I did not give my consent to its use.

Q. 21. In your opinion, was it necessary to make an experiment of that construction in order to arrive at a satisfactory conclusion as to its usefulness for the purpose intended?

A. Yes; in my opinion, it was necessary to make an experiment, and, as I was financially interested in the success of the road, I did not feel warranted in making an experiment that might extend over a period of years and at a considerable outlay.

Q. 22. About how long a time would it be necessary, in your

opinion, to arrive at a positive conclusion as to the durability and general practical character of the construction?

(Objected to on the ground that it has not been shown that the witness has any especial experience with concrete and concrete and iron combination of any description.)

A. My opinion was that for the purpose of cable roads from five to seven years.

Q. 23. Are you familiar with the disposition of the concrete and the iron-work in the road-bed and conduit construction of the Clay-street hill extension and of the California-street cable road?

A. I am.

59 Q. 24. Is there any difference, and, if so, state what, between the disposition and function of the concrete in these two roads?

A. In the Clay-street road there are cast-iron sections that run across underneath the road-bed, supporting the rail and slot iron and having a broad base of sufficient size to allow it to set securely on a sand or earth foundation, vertical ribs supporting the rail. These sections are about 4½ feet apart and the casing of the tube through which the rope runs is formed of concrete. In the California-street construction the yokes are made of rolled iron, with ties and braces, set into a mass of concrete which supports them and forms a complete intermixing or connection of the iron and concrete. The function of the concrete in the Clay-street is to form a tube and protect the rope and in the California-street the concrete is the supporting material.

Cross-examination by Mr. PARDY:

X Q. 25. In that meeting on Clay street, Mr. Hallidie, how did you go to the engine-house—how did the party go to the engine-house?

A. I went in my buggy. I don't know how the others got there.

X Q. 26. Did not the party generally ride up to the engine-house in buggies?

A. I cannot say. I know there were two or three buggies there—mine among the rest.

X Q. 27. Who rode in the buggy with you?

A. I am not positive; I think I rode by myself. I am not positive.

X Q. 28. Did you not ride with Gov. Stanford?

A. No.

X Q. 29. Do you remember giving testimony in the interference case in the Patent Office between Henry Root and Wm. Eppelsheimer in 1882?

A. Yes.

60 X Q. 30. I will read you an answer to a question put to you in that examination: "Ques. What was the occasion of that meeting? A. The meeting was called to consider the question of the construction of the California-street railroad. We met at the

foot of the hill on Clay street—at the Clay-street terminus; examined the works over carefully; went over the whole line to the top of the hill, where the engine-house was. We there discussed the various matters in connection with the proposed California-street railroad. Afterwards we went over California street. I drove Governor Stanford over the road in my buggy." After reading that, Mr. Hallidie, do you remember that circumstance?

A. Yes.

X Q. 31. When you rode with Governor Stanford did you not converse with him separate from the rest of the company in regard to the use of the old rails that were being discarded at that time from the Central Pacific Railroad Company?

A. When I rode with Governor Stanford it was after the question had been discussed, and it is possible that we may have discussed that point, for he was with me in the buggy driving over the road on California street.

X Q. 32. Was there anything said in your presence or hearing at that meeting on the 2d September which would give you a precise idea as to the disposition of the concrete in the road-bed further than to inform you that the concrete would be in some way used as a foundation for the ties, which were to be made out of this rolled iron?

A. Yes; from the explanation made to me concrete formed the principal material, the rolled iron being used simply as a means of holding in place the rails and slot irons.

X Q. 33. Who made that explanation to you?

61 A. Mr. Root made it to myself and others at that time.

X Q. 34. Where was this made, on the line of the road or in the engine-house?

A. In the engine-house, in the office of the Clay-street road.

X Q. 35. Do you remember if anything was said at that meeting about the use of sheet or corrugated iron as a component part of the subway?

A. Yes.

X Q. 36. How was that disposed—the iron?

A. Similar to the original Clay-street road.

X Q. 37. In the original Clay-street road sheet-iron forms the ropeway or tube, does it not?

A. Yes; in conjunction with the cast-iron sections or yokes.

X Q. 38. Then the subway or tube described to you at the meeting on the 2d September was composed of rolled-iron ribs, concrete, and sheet iron, was it not?

A. Described by whom?

X Q. 39. Described at the meeting; I did not say by anybody.

A. I don't quite understand the question.

X Q. 40. I mean the tube that was described to you by Mr. Root.

A. That was not the tube described to me by Mr. Root.

X Q. 41. Was any other tube that was composed of rolled iron and concrete?

A. I cannot say at this distance of time as to the exact form of construction of the two tubes discussed, further than I remember

my own inclination to follow the experience of Clay street, as also to try a tube with ribs made entirely of cast iron.

X Q. 42. Then your memory will not serve you to describe
62 the exact form of construction that Mr. Root proposed further than that you remember the rolled-iron ties or yokes and the concrete?

A. No; I did not say that.

X Q. 43. Was there any sketch made of this Root proposition at the time of that meeting?

A. I have no recollection of any sketch.

X Q. 44. That proposition made by Mr. Root did not receive your approval, I understand?

A. No, sir.

X Q. 45. Was there any one besides yourself that disapproved of it and doubted its success if adopted? If, so, state who they were.

A. My impression is that Mr. Britton concurred in my views.

X Q. 46. Did Mr. Root advocate it and speak of it as being a device as could be relied upon for durability?

A. He did; and that was his opinion.

X Q. 47. Did not Gov. Stanford hold the same opinion?

A. I think he did, in a measure.

X Q. 48. Did not S. S. Montague?

A. I don't remember about Mr. Montague.

X Q. 49. Did not Mr. Canavan strongly advocate it?

A. I am not sure. My recollection is Mr. Canavan was divided between that and cast iron.

X Q. 50. You used on the Clay-street road extension a tube formed of concrete, open at the top and combined with iron ribs, did you not?

A. We used concrete placed between the iron sections, forming a channel and partly covered in by timber on top.

X Q. 51. Did you have any doubt when you formed that construction as to its being durable and fitted for the purpose for which it was intended?

A. I thought it was fitted for the purpose for which it was intended.

63 X Q. 52. There was nothing of an experimental nature in the use of the concrete in that road, was there?

A. It was simply a substitute for the sheet-iron, which, I think, at that time we could not obtain.

X Q. 53. Question repeated.

A. As its function was simply that of a substitute for sheet-iron, it was not intended to affect the stability of the whole structure. I did not consider it as an experiment, as the question simply lies between the use of concrete or brick-work.

X Q. 54. Did you ever hear of the use or was it ever proposed to you to use concrete in cable-railway subways before this meeting of the 2d September?

A. No.

X Q. 55. You had a tube designed at the time of this meeting of

the 2d September which you were personally advocating for adoption, did you not?

A. I think so.

X Q. 56. Will you please state how that tube was made?

A. My recollection is that it was made of cast iron, in sections of about 12 or 15 feet long, with ribs and base piece about 4 feet apart, so as to give stiffness to the tube and to enable us to tamp under the base piece.

X Q. 57. Was any such form of construction used before?

A. Not that I am aware of.

X Q. 58. Had that form of construction been used on the California-street road would it not have been an experiment equally with the concrete tube?

A. I thought not.

X Q. 59. There was no precedent for its adoption?

A. Not to my personal knowledge, and certainly not in connection with cable railroads.

Adjourned to Tuesday, April 17th, 1888, at 2 o'clock p. m., at the same place.

64 Met, pursuant to adjournment, at the office of Wm. F. Booth, on Tuesday, April 16, 1888.

Present: William F. Booth, Esq., of counsel for complainant; George Pardy, Esq., of counsel for respondent, and the witness, A. S. HALLIDIE, whose examination was continued as follows, viz:

By Mr. PARDY:

X Q. 60. Was there any subway described in your presence and hearing at that Clay-street meeting of September 2d, in which concrete, iron ribs, and corrugated iron were used in combination to form the tube and road-bed?

A. Well, I don't know. There was so many points discussed that it would be impossible to remember at this distance of time other than prominent ones.

X Q. 61. Then such a tube may have been described, so far as you know, at that meeting?

A. It may have.

X Q. 62. I will now read you from testimony given in the beforementioned interference proceedings by Mr. Montague in relation to a construction proposed to him by Mr. Root for the purposes of the California-street road:

"Ques. 12. Do you recollect the description of this concrete tube as given by Mr. Root at that time sufficiently to state how it was made? Ans. I think I do. Mr. Root's proposition was to make the main frame the support of the bottom of his tube and track by binding old railroad bars in a V shape, those bars to extend diagonally to a point nearly the level of the top of the proposed tubes, then for a short distance horizontally, to form a support for the rail. To the upper portion of these rails, as bent, was to be attached a brace or bracket, to which the angle iron which was to form

65 the slot of the tube were fastened. These frames or ribs were to be placed at proper intervals apart on the line of the proposed tube and connected by sheets of corrugated iron, and to have a backing of cement to form the sides, a solid cement foundation to form the bottom of the tube, in which cement these rails or frames were to be embedded."

Does that description of Mr. Montague's corrrespond with your remembrance of the device proposed by Mr. Root at that meeting of September, as far as you now remember?

A. Not entirely.

X Q. 63. Please state any difference you may recognize.

A. The only essential point of difference I notice is the introduction of the corrugated sheet-iron.

X Q. 64. Was there sufficient description made to you personally by Mr. Henry Root at that meeting of September 2nd to preclude the idea that he intended to dispense with the use of the sheet or corrugated iron as a longitudinal connection between the ribs or yokes?

A. Yes.

X Q. 65. Question 64 repeated.

A. Well, I supposed Mr. Pardy meant to convey the idea that Mr. Root intended to dispense with the use of sheet-iron, and that I understood to be Mr. Root's intention.

X Q. 66. Are you positive on that point?

A. Yes.

X Q. 67. Did you have any drawing, sketch, or model to guide you in your understanding of Mr. Root's device?

A. No.

X Q. 68. You state in your examination that it would take from five to seven years to arrive at a conclusion as to the practicability of this concrete construction. I will now read from your testimony given at the before-mentioned interference proceeding:

66 "Ques. 20. How long would it take to decide upon such a construction as that" (meaning Root's device)? "Ans. I should not like to give my opinion as to the result under two or three years' actual use, or even longer."

Which of these opinions do you now hold and why have you changed your views upon that subject?

A. Each opinion is consistent with the other, and I have not changed my views. Of course I am speaking now as to the condition of cable railroad construction as then understood.

X Q. 69. When was the California-street road opened for traffic?

A. I don't remember exactly.

X Q. 70. Do you remember the year?

A. I think in 1878, or very early in 1879.

X Q. 71. When was it the Chicago road was opened for traffic, if you know?

A. I don't remember; I think somewhere about the same date. I am not positive.

X Q. 72. Do you know anything about the construction of the Chicago subway or tube?

(Objected to as not proper cross-examination.)

A. In a general way; not sufficient as to give evidence in detail.

X Q. 73. Do you know if it was constructed of concrete and iron ribs combined, substantially as the plan of the California-street road, as far as the combination of the two materials are concerned?

(Same objection.)

A. My impression is that the wrought-iron ribs run much deeper in that case. The conditions require care on account of the climate and would necessitate a little modification.

X Q. 74. Concrete was used in the formation of the tube, was it not?

(Same objection.)

A. Yes.

67 X Q. 75. Do you know whether this construction as used in Chicago was adopted within the period of three years after the opening of the California-street road?

A. Well, I cannot say, but that is my impression.

X Q. 76. Was not the Chicago enterprise a very extensive one?

A. Yes.

X Q. 77. And did it not include the expenditure of a vast amount of money?

(Same objection.)

A. Undoubtedly.

X Q. 78. Will you please state what your experience is with concrete in your own personal practice?

A. My experience in bridge construction—in which I use it very largely—in the foundation of piers it is in every respect admirably adapted. In the construction of wire suspension bridges I have used it in the anchorages of the cables in cases where I was unable to secure large blocks of masonry and where I could not bolt into the hard rock, preferring masonry or the rock for the reason that I have always felt a little insecurity from the disintegration of the concrete in the vibration of the cables. I have used it in the foundations of buildings, chimneys, in the construction of walls, in the building of dams, and more recently in the foundations for steam-engines. I have also used it in the extension of the Clay-street railroad.

X Q. 79. How has the California-street railway construction of subway stood up to the present time?

A. As far as I know, very well.

X Q. 80. Are you interested, directly or indirectly, in the outcome of this suit?

A. I own stock in the Pacific Cable Railway Co., who control most of the patents affecting cable railway construction.

68 X Q. 81. Is the patent here in controversy owned or controlled in any way by any company of which you are a stockholder?

A. Yes; in so far as the Pacific coast is concerned; at least, that is my impression.

X Q. 82. Are you not a stockholder in the National Cable Railway Co. of New York?

A. No.

Redirect examination by Mr. BOOTH:

Q. 83. Upon cross-examination you were asked if you knew when the California-street cable road was opened for traffic, and also with relation to the Chicago road, and you answered that, as near as you could recollect, the former road opened in 1878 or very early in 1879, and that the time of the latter road was about the same. I now show you a pamphlet entitled The National Cable Railway Co., the system of wire cable railways for cities and towns, and refer you to the page of that pamphlet entitled tabular statement containing information as to various cable roads in operation, and I will ask you to state from that pamphlet when those two roads went into operation.

A. (Witness reads:) California-street railroad commenced operating April 9, 1878; Chicago city railway, January 28, 1882.

Q. 84. What is your view as to the correctness of those dates?

A. I believe the dates are correct; I believe I tabulated this statement myself.

The witness desires to correct his answer to cross-question No. 42 by striking out the word "two," in line 10, page 49, and inserting the word "various."

(Signed) ANDREW L. HALLIDIE.

69 Examination-in-chief of L. B. BENCHLEY by Mr. BOOTH:

Q. 1. Please state your name, age, residence, and occupation.

A. My name is L. B. Benchley; my age, sixty-five years; residence, the city and county of San Francisco, and occupation, general manager Pacific Rolling Mills Co.

Q. 2. Are you acquainted with Henry Root, the complainant; and, if so, for how long have you known him?

A. I have known him for fifteen years; I guess probably seventeen years.

Q. 3. How long have you been connected with the Pacific rolling mills?

A. I have been connected with it for twenty years.

Q. 4. (Office copy of letters patent of the United States No. 262,126, Aug. 1, 1882, issued to Henry Root, shown the witness.) Please look at the drawing of that patent and say if you understand them.

A. (Witness examines:) I do.

Q. 5. What do you find there represented? State generally.

A. Generally, it is a system of cable-road construction. I find the rails, the slot, and the yoke, and the concrete representing the construction of the cable road-bed.

Q. When did you first acquire any knowledge or information

with regard to such a construction as you find there represented, and from what source?

A. In the summer of 1876, from Henry Root.

Q. 7. Please state the circumstances under which he made them known to you, as near as you can now remember them.

A. During that summer, as general manager of the Pacific Rolling Mills Co., I had an interview or interviews with Mr. Root
70 in relation to furnishing the material for the construction of cable roads, and discussed with him his plans for building the same, with a view of fixing upon price for furnishing the yokes and other material by our company.

Q. 8. Did he then tell you how he proposed to use the yokes?

A. He did. They were to be set in concrete foundation and sides, the inner section of the yoke between the base and the upright section to which the slot rail is attached forming the tube of the road-bed. This statement was made in a general way—the statement in relation to the manner of construction of the road and road-bed.

Q. 9. Was it sufficient to enable you to understand the construction?

A. Yes, sir; in a general way, as stated.

Q. 10. Do you recognise the invention which is shown in the drawings of the patent which I have shown you as being substantially that which he explained to you at that time?

A. I do.

Q. 11. Mr. Benchley, can you not fix the time at which Mr. Root told you of this construction a little closer than you have done?

A. I know that it was prior to September of 1876.

Q. 12. How do you know this?

A. Because I left San Francisco for New York in the latter part of September, 1876, and this was prior to my leaving.

Q. 13. Well, that might fix it in September itself. Why, then, do you say that it was prior to September?

A. I spoke in a general way as to time. It might possibly have been in the early part of September at which one of the interviews with Mr. Root was held.

Q. 14. Do you remember doing any work in connection with a model section or experimental section of this construction?

A. I do.

71 Q. 15. Please state the circumstances—what you did, about when, and for whom.

A. After my return from the East, in November, 1876, I think, in going to our works from the city office, and when near the works, I met Mr. Root coming from there. I spoke with him, asking him what, if anything, we could do for him. He replied he had with him a sketch or drawing of a cable-road yoke from which he would like some made. He returned with me to the mills, and I instructed the superintendent to make what Mr. Root required.

Q. 16. Were the yokes so made similar to those which you see in the drawing of that patent?

A. I think they were, sir.

(Signed) L. B. BENCHLEY.

At this point adjournment taken until Wednesday, April 18, 1888, at two o'clock p. m., at same place.

SAN FRANCISCO, CAL., WEDNESDAY, *April* 18, 1888.

Met pursuant to adjournment.

Present: Wm. F. Booth, Esq., of counsel for complainant; George Pardy, Esq., representing Mr. Dickinson, of counsel for respondent, and Henry Root, whose examination was then had as follows:

Examination-in-chief of HENRY ROOT by Mr. BOOTH:

Q. 1. Please state your name, age, residence, and occupation.

A. My name is Henry Root; my age, forty-two years; residence, the city and county San Francisco, 712 Sutter street, and occupation, civil engineer.

Q. 2. How long have you resided in San Francisco?

A. Most of the time since 1870.

72 Q. 3. What has been your employment?

A. I have been assistant engineer for the Central and Southern Pacific Railroad Companies and engineer in charge of the street railroad tracks owned and controlled by the same owners or some of them, being the Market Street, California Street, Potrero, and Bay View Railroad Companies.

Q. 4. Are you the complainant in this case?

A. Yes.

Q. 5. (Office copy of complainant's patent sued on shown the witness.) Mr. Root, please fix the date as near as you can of your conception of the invention which is shown in that patent.

A. In the summer of 1876, between May and the first day of September.

Q. 6. How do you fix those times between which you say you conceived that invention?

A. I have in an old memorandum book a date on which I went to the Clay Street Hill Company's engine-house, in this city; that was on the 8th of May, 1876, and I know that the invention was made subsequent to that time. I also have a memorandum of a talk which I had with L. B. Benchley, general manager of the Pacific Rolling Mills Company, in regard to that invention, so I know the invention was made between the two dates I have just mentioned.

Q. 7. When was that talk with L. B. Benchley?

A. On the 17th day of August, 1876.

Q. 8. What were the circumstances of your conception of that invention?

A. At that time, in addition to the duties I have heretofore mentioned, I was doing whatever private or other work Gov. Stanford had in this city. In the early part of the year 1876 Gov. Stanford and his associates, Chas. Crocker, Mark Hopkins, D. D. Colton, together with A. S. Halladie, Jos. Britton, and others, obtained

73 a franchise for the construction of a wire cable road on California street, and it was intimated to me by some one, either Gov. Stanford himself or some one employed in his interest, that it was probable I would be called upon to construct that road, and I im-

mediately commenced studying up the matter to be prepared to recommend a plan of construction whenever called upon.

Q. 9. How did you go about studying up the matter?

A. By examining the road then in operation and thinking over requirements, the Clay-street hill road being the only road then in operation.

Q. 10. How did that examination show you the requirements?

A. It did not show all the requirements, but it did some of them.

Q. 11. Well, what did you deem requirements in a cable-road construction, as far as the subway and road foundation were concerned?

A. In the first place, to get a smooth, even roadway and track and the tube or tunnel way for the cable and its carrying machinery strong enough to resist any tendency towards the closing of the slot, provide for the grip-shank, and to make a structure as a whole permanent and durable to stand the wear and jar of a heavy street traffic, as well as that of the car traffic which it was designed to carry.

Q. 12. What parts and construction did you conceive were necessary to obtain these results?

A. In the first place, a rib or yoke, with connections to the two rails and the two slot irons, so as to connect them permanently, and this skeleton yoke to be embedded and supported by surrounding mass of concrete to form a support and foundation for the ribs or yokes; the bottom and sides of the cable tube or tunnel and a foundation for the paving of the roadway.

Q. 13. Did you ever explain the invention which is shown in your patent to others; and, if so, to whom?

74 A. I had explained it to several, including S. S. Montague and Jno. J. Haley, prior to the 2d day of September, 1876; but I remember on that date of having discussed the subject and explained this invention in a general way at a meeting of the directors of the proposed California-street road.

Q. 14. Is Mr. Montague dead?

A. Yes.

Q. 15. Who were present at the meeting on the 2d September?

A. Gov. Stanford, A. S. Hallidie, Jos. Britton, H. L. Davis, J. J. Haley, S. S. Montague, P. H. Canavan, Isaac Wormser, and I think some others.

Q. 16. You say you explained it to Jno. J. Haley before the 2d September. How did you explain it to him? I mean what means did you employ to convey to him the invention?

A. I had told him how I would construct the road if I had my way in regard to it. As near as I can remember, the description I gave him was of a general character, like this: I said I would use for the main part of the ribs or yokes old, worn-out rails taken from the steam-road tracks, these rails being bent so as to go under the cable tube and form a connection between the two rails of the cable track, and also to rivet to these same rails uprights properly braced to support the slot rails of the cable tube; the whole of the skeleton frame thus formed to be bedded in a continuous mass of concrete.

Q. 17. Do you remember if you made any sketch to illustrate this to him?

A. I don't remember whether I did or not.

Q. 18. Did you at any time make any sketches of it; and, if so, can you state about when you made the first one and the dates of any others you may have made?

75 A. I know I had made one sketch some time prior to that 2d day of September, but I cannot tell the date and don't remember who it was made for.

Q. 19. How did you explain it to those gentlemen on the 2d September, at the meeting on Clay street?

A. I had previously explained it to Mr. Montague and Mr. Haley, and I think some others, and I explained it at that time by description in the same way that I had previously done in explaining it to Mr. Haley.

Q. 20. Did you ever make a model embodying the invention shown in your patent in suit? If so, state when and under what circumstances.

A. Yes. Some two months later, I think, in November, 1876, I had two rails bent at the California rolling mills and sent to the Hope iron works, where the remainder of the iron-work was done, to complete two of the ribs as I have described. These I had taken to the general office yard of the Central Pacific, corner Fourth and Townsend streets, in this city, and they were set up and an outside casing and cover made and the space between filled in with concrete, encasing the skeleton yokes and forming the shut section of the completed track and tube.

Q. 21. When was the model completed?

A. A little before the 1st January, 1877.

Q. 22. Did you ever embody the invention shown in your patent sued on in an operative cable railway; and, if so, what railway, where, and when?

A. Yes; first in the construction of the road along California street, in this city, from Kearny to Filmore streets, completed about April, 1878, and subsequently to a much larger extent in the conversion of the Market-street road, in this city, to a system of cable roads, completed about August 1st, 1883.

Q. 23. What was your connection with the California-street cable road?

76 A. I was the constructing engineer and superintendent of construction. I had the entire management of the construction of the road.

Q. 24. When did you begin this construction?

A. We commenced getting out material in May, 1877, and commenced active work on the street in July of the same year.

Q. 25. When you say you had full control, to what extent are we to understand this?

A. At that time—I mean the time of commencement of the work, while the company was a corporation—Governor Stanford owned about nine-tenths of all the stock, and I looked to him alone in regard to matters involving large expenditure of money. I had the

employing of all the men with, I think, the single exception of the secretary of the company, and no bills of any kind were paid for either labor or material, except upon my certification to their correctness.

Q. 26. I will show you a letter dated August 16, 1877, signed by Leland Stanford and directed to you, and ask you if that is the sole instance in which Governor Stanford exercised direction in the matter.

(Letter handed witness.)

A. I think it is.

(Letter introduced in evidence and marked "Complainant's Exhibit Stanford Letter No. 1.")

Q. 27. I show you another letter and ask you if you recognize it; and, if so, state what it is.

(Letter shown to witness.)

A. Yes; this is a letter brought to me as a letter of introduction by Thomas Seals, but he was given the place as a foreman at that time and not as superintendent.

(Letter introduced as evidence and marked "Stanford Letter No. 2, Complainant's Exhibit.")

77 Q. 28. Who gave him the place as foreman?

A. I did.

Q. 29. How long were you connected with the California-street cable road?

A. I was connected with it directly up to the time that Gov. Stanford sold his stock in the road, which was about September 1, 1883. I have done some work for the company since that time, but only in an advisory way.

Q. 30. Up to the time when you applied for this patent was that California-street road under your inspection and surveillance?

A. Yes.

Q. 31. Before you began the construction of that road were there any objections or doubts expressed as to the construction as shown in your patent?

A. Yes.

Q. 32. What was the character of these objections or doubts?

A. I remember talking with Charles Crocker on the subject, and he expressed to me his doubt in regard to the durability of such a structure as that then being put down, as I have just described, on California street by saying that he feared that the jar of street traffic as well as that of the cars would in time loosen the iron ribs or yokes and separate them from the surrounding concrete, and that the structure would fail to be what was required.

Q. 33. What effect, if you know, did these doubts of Mr. Crocker have upon his connection with that road?

A. Mr. Crocker was one of the original parties to whom the franchise for that road was granted by the city authorities, but he never

paid any subscription or took any stock, as he had the privilege of doing, and I believe——

78 (Counsel for respondent objects to this answer on the ground that it is immaterial and incompetent, and, besides, Mr. Crocker has been notified to us as a witness in this case and can testify to the matter himself.)

—from the conversations with him at the time, which I have just stated, that he had doubts of its durability.

Q. 34. Do you know of doubts entertained by other people; and, if so, by whom?

A. Yes; I remember having heard doubts expressed at that time by A. S. Hallidie and Jos. Britton.

Q. 35. Did you have any doubts of the durability and general practicability of the construction of the subway and roadway as laid down by you in the California-street cable road.

A. Yes.

Q. 36. Based upon what?

A. While I believed that there was more than an even chance of its proving a durable and desirable structure, I still had some doubt in my own mind, which was increased somewhat by the doubts expressed to me by others in whom I had confidence.

Q. 37. What would affect the durability of such a structure?

A. There are several causes which would contribute to its destruction: 1st, the moving of cars over a rail connected to iron-work without the intervention of any wood; 2d, the street traffic of trucks and teams, to which such a structure would necessarily be exposed; to the changes of temperature; and, lastly, the effect of time and the danger of the water following down the different members of the iron-work, and the rust separating it from the concrete.

Q. 38. In what way could these matters be determined?

A. I don't know of any way but by trial in a public street through a long period of time.

79 Q. 39. Were you familiar at the time you commenced the construction of the California-street cable road with the condition or state of the art regarding cable or wire-rope street railways?

A. Yes.

Q. 40. What knowledge could you have derived from the previous state of the art which could have assisted you in the determination of the question of the durability and general effectiveness of the construction of the California-street cable railroad?

A. There was no way that I am aware of of obtaining that information except by actual trial. The only street railroad then in operation in this or any other country, to the best of my knowledge and belief, was the Clay-street hill road in this city, which road was a different character of a structure.

Q. 41. You spoke of having doubts yourself as to the durability of your construction. Were such doubts present at any time after the California-street road had been in operation; and, if so, when and by what caused?

A. Yes; during the spring of the year 1879 the California-street road was extended from Fillmore street to Central avenue, but by a wooden structure not nearly so durable or costly as the original road. In preparing for that extension I had occasion to dig out and around so as to expose some of the old structure. I saw therein some indication of the loosening of the yokes in the concrete, and I had some little fear at that time that some trouble might arise in that respect.

Q. 42. Now, Mr. Root, I will ask you why you did not apply for your patent for that construction within the two years allowed by law from the time when you first put this construction into use.

A. For the reason that if the structure proved weak or un-
80 desirable I did not want any patent, and I did not feel certain enough of that fact until the year 1882—I mean 1881.

Q. 43. You know the construction of the conduit of the Clay-street hill extension?

A. Yes.

Q. 44. Did you know it at the time it was being constructed?

A. Yes.

Q. 45. Please state whether or not that construction embodies your invention, as shown in your patent sued on, and give reasons for your opinion.

A. I don't consider it so. The Clay-street hill extension consists of cast-iron frames, having flat, horizontal bottoms, set at intervals on the original earth or sand. Between these cast-iron yokes the tube is formed of concrete, but that concrete does not extend through the yoke or support it to any material extent. The roadway is formed of planking, which rests upon longitudinal wooden stringers, which in turn rest upon the natural earth, as stated.

Q. 46. Please compare the function of the concrete in the Clay-street hill extension with that of the concrete in your invention.

A. As I understand it, the sole function of the concrete is to form a tube or tunnel way in the Clay-street hill extension road, while in the California-street road it acts with the iron to hold the slot open to form a foundation and support for all the rails and iron work and the direct support for the paving of the roadway.

Adjourned to 10 o'clock a. m. Thursday, April 19, 1888, at the same place.

81 COMPLAINANT'S EXHIBIT STANFORD LETTER NO. 2.

"Office of the Central Pacific railroad, president's department.

SAN FRANCISCO, CAL., 13 *Aug.*, 1877.

Henry Root, Esq.

DEAR SIR: This will be handed you by Mr. Thomas Seales, the gentleman of whom I spoke in relation to the superintendency of the California St. R. R.

Yours, etc., LELAND STANFORD."

COMPLAINANT'S EXHIBIT STANFORD LETTER No. 1.

"Office of the Central Pacific railroad, president's department.

SAN FRANCISCO, CAL., 16*th Aug.*, 1877.

Henry Root, Esq.

DEAR SIR: This will be handed you by Mr. T. W. Hinchman, the gentleman I have selected for secretary of the California-street railroad.

Yours, etc., LELAND STANFORD."

SAN FRANCISCO, CAL., *April* 19, 1888.

Met pursuant to adjournment.

Present: Wm. F. Booth, Esq., of counsel for complainant, and George Pardy, Esq., representing Mr. Dickinson, for respondent.

By consent the witness Henry Root was temporarily withdrawn for the purpose of examining Henry L. Davis.

82 Examination-in-chief of HENRY L. DAVIS by Mr. BOOTH:

Q. 1. Please state your name, age, residence, and occupation.

A. My name is Henry L. Davis; my age, sixty years; residence, 923 Hyde street, San Francisco, and occupation, president National Cable Railway Co. My office is 329 Market street, San Francisco.

Q. 2. Do you know Henry Root, the complainant in this case?

A. Yes.

Q. 3. How long have you known him?

A. Twelve to fifteen years.

Q. 4. Have you had any connection with cable roads in San Francisco?

A. Yes.

Q. 5. What roads?

A. Clay-street hill.

Q. 6. (Office copy of letters patent 262,126, Aug. 1, 1882, granted to H'y Root shown the witness.) Mr. Davis, please look at the drawings in that patent and say if you know what they represent.

A. (Examining paper:) They represent the conduit or tube as constructed of the California-street cable road in San Francisco.

Q. 7. When did you first acquire any knowledge or information of such a construction?

A. The first discussion of this construction occurred at a meeting of gentlemen at the office of the Clay-street hill railroad, San Francisco.

Q. 8. Who were present at that meeting?

A. I recollect Gov. Stanford, A. S. Hallidie, H'y Root, Jos. Britton, Mr. S. S. Montague, chief engineer Central Pacific; Jno. J. Haley, David Porter, Mr. Isaac Wormser, and myself. That is all I recollect.

Q. 9. I will read to you a question and answer in an interference

proceeding between H'y Root and Wm. Eppelsheimer in the
83 Patent Office, the testimony in which was taken in 1882. The question and answer is taken from the testimony of Mr. A. S. Hallidie:

"Ques. 11. Do you recollect of any meetings that took place during that year for the purpose of determining as to the construction of that road (meaning California St.)? And, if so, state any important one and about the date.

"Ans. 11. I recollect we had several meetings, and remember having a meeting on Sept. 2, 1886. We went over the Clay-street railroad, met at the terminus of the road at 10 o'clock in the morning, went up the road to the engine-house, and had a general discussion there upon the construction of the road. Mr. Britton and Gov. Stanford, Henry L. Davis, S. S. Montague, P. H. Canavan, David Porter, and John J. Haley, I remember those gentlemen very well. We had considerable discussion as to the mode of constructing the line and the road-bed." Is that the meeting to which you have reference?

A. Yes.

Q. 10. You say that plan of construction represented by the drawings of the patent you were looking at was discussed at that meeting; who presented that plan for discussion?

A. Mr. Root.

Q. 11. Did he talk to you personally about it at that time?

A. Yes.

Q. 12. So that you could understand it?

A. Generally.

Q. 13. What fixes this on your memory? State any of the accompanying circumstances you may remember.

A. As a director and stockholder in the Clay Street Hill Company, we were contemplating an extension of said road; naturally I felt interested in the construction or the different modes of construction.

84 Q. 14. Did you afterwards see that plan of construction embodied in the California-street cable road?

A. Yes.

Q. 15. Did you recognize it as being that which Mr. Root had described to you at the time above referred to?

A. Yes.

Cross-examination by Mr. PARDY:

X Q. 16. You say, Mr. Davis, that the discussion had at that meeting of September 2d in relation to the tube or subway said to be proposed by Mr. Root was of a general nature. There were no sketches, models, drawings, or exhibits of any kind made to exemplify the details of that construction submitted at that meeting, were there?

A. There were some pencil drawings, that is my recollection, at that meeting, giving an idea of the construction.

X Q. 17. Do you recollect who made them or when they were made?

A. I recollect during the discussion Mr. Root and myself stepped outside of the office into the car-house and he explained substantially this construction now before me in this drawing (referring to office copy of patent 262,126). My impression is that he took his pencil at that time and drew in a rough manner on a piece of paper this construction.

X Q. 18. You say that is merely an impression. You are not positive of it?

A. Oh, yes, I am positive; we stood at the work-bench and with his pencil substantially drew this construction with an explanation.

X Q. 19. How long did it take him to do that?

A. But a few moments; a short time.

X Q. 20. Do you mean to say that in that sketch all the details as embodied in that patent before you?

A. I do not.

85 X Q. 21. The drawing that is part of the patent before you is more elaborate and may contain additional elements of construction beyond those which were illustrated in the sketch you speak of; may it not be so?

A. It may be so, but I will explain what he did do. He drew in a rough manner the bent rib or yoke supporting the rail and slot and filled in with cement from the outside and as he drew these he explained the method of construction.

X Q. 22. How did he show the cement in that sketch?

A. Oh, simply scratching with his pencil where the cement should go. It was a very rough drawing.

X Q. 23. Are you an engineer or a mechanic or an expert in the matter of examining mechanical construction?

A. No.

X Q. 24. Are you interested directly or indirectly pecuniarily in the outcome of this suit?

A. Yes.

(Signed) HENRY L. DAVIS.

Henry Root's examination continued until Friday, April 20, 1888, at 10 o'clock a. m., at the same place, to which adjournment was by consent taken.

Office — Wm. F. Booth, Esq.

SAN FRANCISCO, CAL., FRIDAY, *April* 20, 1888.

Met pursuant to adjournment.

Present: Wm. F. Booth, Esq., of counsel for complainant; George Pardy, Esq., representing J. H. Dickinson, Esq., of counsel for respondent, and the witness, Henry Root, *the witness*, whose examination was continued as follows:

86 By Mr. BOOTH:

Q. 47. In one of your previous answers you stated that you had

embodied the invention shown in your patent sued on in the Market-street cable road. What connection had you with that road?

A. I was constructing engineer and superintendent of construction.

Q. 48. What was that road originally?

A. Horse road.

Q. 49. When was the project of converting it into a cable road first considered, if you know?

A. I heard it mentioned to some of the parties interested in it as early as 1876; possibly earlier.

Q. 50. Who were these parties?

A. Gov. Stanford was the principal one I have reference to and Mark Hopkins and Charles Crocker others.

Q. 51. When was the conversion of it to a cable road actually commenced?

A. A little work was done on the terminal arrangements and at the engine-house about 1880, but no work on the street was commenced until about the 1st June, 1882.

Q. 52. Did the work which was done in December, 1880, involve the construction as shown in your patent?

A. It did not. It had nothing to do in determining the character of the construction of the road-bed.

Q. 53. What did the work on the street, which you say was commenced in June, 1882, consist of?

A. It consisted of the actual construction of the road by setting the yokes and filling in with concrete.

Q. 54. Do you know any of the reasons why, although the project was first mentioned as early as 1876 of converting the Market-street road into a cable road, the work on the street, which involved the construction of the conduit and road-bed, was not commenced until 1882?

87 A. The Market-street road was owned by Stanford, Crocker, Hopkins, and Huntington, and I understood that Stanford's associates, especially Charles Crocker, were not willing to go ahead with it at that time, and I believe his reason—his principal reason—was that he had some doubt about the permanence and durability of the plan proposed, and my reason for thinking so is that I had heard him say about the time or soon after the construction of the California-street road that he had fear of that form of construction; that the iron-work might work loose in the concrete by the jar of traffic on the street, and, if it did so, there would be no remedy.

(Counsel objects to previous question and answer, and moves it be stricken out on the ground that it is incompetent and immaterial, the witness not being shown to be in the confidence of the projectors and owners of the road sufficiently to give him accurate knowledge of their motives for delay, nor is it shown to what extent, if any, Mr. Crocker was interested, and, as to the matters and things involved, the party mentioned is in this city to testify in the matter.)

Q. 55. What effect, in your opinion, would the failure of the conduit and roadway construction of the California-street cable road have had upon the building of the conduit and roadway of the Market-street road?

A. It would have changed the entire plan of construction or would have stopped the conversion of the Market-street from a horse to a cable road.

Q. 56. What bearing, in your opinion, had the success of the construction of the conduit and roadway of the California-street cable road upon the subsequent enterprise of converting the Market-street road into a cable road?

A. It had the effect of substantially the same plan being adopted and used in the construction of the Market-street road and its branches.

88 Q. 57. Do you know whether the California-street cable road had for its sole object the success of that road? And, if there was any other object in building and operating it, please state what that was.

(Objected to by counsel for respondent on the ground that it is not shown that the witness was interested in building the road further than as an employee.)

A. I believe one object in building that road was to make a trial, looking to the much larger operations in the future, especially the Market-street road. My reasons for thinking so is what I was told by Gov. Stanford and his associates at that time and soon after.

Q. 58. What was the cost, approximately, of the California-street cable road?

A. Including everything, rolling stock and all, $418,800—as completed in the year 1878.

Q. 59. What was the cost, approximately, of the Market-street system of cable road?

A. As completed in August, 1883, about $2,000,000. My estimate was $1,775,000. The actual cost overran that somewhat.

Q. 60. To what extent, if you know, was Charles Crocker interested in the Market-street system as converted to a cable road?

A. I don't know positively, but I have good reason to believe that he was one-fourth owner.

Q. 61. Do you know, however, that he was largely interested in it?

A. I do, for the reason that he told me so.

Q. 62. I believe you have stated that, although he was one of the original projectors of the California-street cable road, he afterwards refused to become financially interested in it, did you not?

A. Yes.

89 Q. 63. Mr. Root, did you hear the testimony which was given in this case by Mr. W. H. Milliken on behalf of the respondent?

A. Yes.

Q. 64. I will read you a few questions and answers from that testimony as follows:

"Q. 22. Mr. Milliken, do you remember a short section or model of the California-street tube construction being made and exhibited on Fourth and Townsend streets in the yard of the railroad company prior to the actual construction of the California-street road?

"A. I don't know anything about the manufacturing of the model, but I saw a model there in the yard, and my attention was called to it by Mr. Root as being a plan of the construction of the California-street road.

"Q. 23. Do you know who was the designer of that model?

"A. I don't know of my own knowledge who was the designer, but I was told.

"Q. 24. Will you be kind enough to state who told you in regard to that matter and what was said?

"A. Mr. Root told me that it was Mr. Wm. Eppelsheimer's design."

I will now ask you if you did so tell Mr. Milliken that it was Mr. Eppelsheimer's design.

A. I did not. I never told him anything of the kind.

Q. 65. Did you ever tell any one else so at any time?

A. No.

Q. 66. Did you ever tell any person at any time during the construction of the California-street cable railroad or at any other time that the invention or design of said road or any part thereof was the design or invention of said Eppelsheimer or of any one else other than yourself?

A. I did not.

90 Q. 67. Are you positive and do you know that you did not?

A. Yes; I am as positive as I can be of anything.

Cross-examination by Mr. PARDY:

X Q. 68. You were connected with the Market-street and Potrero roads at the time they were horse roads, were you not?

A. Yes.

X Q. 69. What kind of tie did you use on that road—if more than one kind please state—to tie and support the rails?

A. Ordinary redwood, I think; I have no recollection of anything special.

X Q. 70. Did you ever use any old iron or rails for ties on either of those roads?

A. I don't think we ever used any or more than one, if any.

X Q. 71. Did you ever put any concrete under that one that you put down?

A. We used no concrete whatever.

X Q. 72. State what you did use. Please describe how you laid that experimental one.

A. I did not say I laid any.

X Q. 73. Please state the circumstances connected with the use of one or more old rails for a tie or ties on either of the before-mentioned roads.

A. I have not stated that we have used a tie or ties on either of the roads of iron. I have a vague recollection of having made a tie of that kind, but I don't know whether it was used at all.

X Q. 74. Do you remember receiving any instruction from any of the heads of department or others in authority connected with the Central Pacific railway to utilize, if possible, the old rails that were being taken from that road as ties for the horse road? If so, you might state who gave those instructions.

91 (Counsel for complainant states this line of cross-examination is objected to as not being proper, and for the further reason that this testimony should have been elicited on direct examination when this witness was called heretofore by the respondent.)

A. I have no recollection of receiving any instruction in regard to that matter, and I don't believe that I did.

X Q. 75. Is it not a fact that there were a large quantity of old rails taken from the steam roads which were under the control of these gentlemen connected with the horse-car roads which you knew they desired to utilize?

A. It is a fact that there were large quantities of old rail removed, but they were always salable at the market price of such old material, and I only knew on general principles that they were low-priced material, and it was desirable to utilize them as such if it could be done to advantage.

X Q. 76. In putting such rails in the road-bed of a horse road would you deem it necessary to broaden their foundation by bedding under them with concrete or some other equivalent material?

A. Yes; I would think that would require some other material under them, not necessarily the equivalent of concrete.

X Q. 77. Now, in the application of cut-up rails with underlying concrete there would not necessarily be involved any invention for that purpose, would there?

A. I don't know whether there would or not.

X Q. 78. Are not iron ties common enough for railroad purposes?

A. They are not common. I know of their being used.

X Q. 79. And such ties have invariably been supported by some suitable foundation underneath them—is not that so—other than the natural ground?

92 A. I have no personal knowledge of any such plan.

X Q. 80. If such iron ties were bent down in the center to escape or to pass under any obstruction, as the tube of a cable railway, would there be any invention in so bending them in that application?

A. As I said before, I don't know. I don't understand what you refer to by "such iron ties."

X Q. 81. I mean any iron ties, whether they be old rails or other shaped bars.

A. There might be or might not be. I cannot answer that question.

X Q. 82. Suppose I were to take an old rail, bend it down in the

center, put it under the tube, as it now exists on the Clay-street hill road, support the rails thereupon, and put an underlying bed of concrete in connection therewith, would that of itself be such a novelty of construction as to involve an invention?

A. It would certainly not be new at this time, and I don't know as there would be any novelty in that at any time.

X Q. 83. Do you remember describing a plan of road-bed to S. S. Montague in 1876?

A. I have no particular instance in mind, but I think I did do so.

X Q. 84. Do you remember Mr. Montague giving testimony in an interference proceeding between yourself and Eppelsheimer in which he, Mr. Montague, stated that you proposed to make the main frame the support of the bottom of your tube and track by bending old railroad bars in a V shape, those bars to extend diagonally to a point nearly of the top of the tube, then for a short distance horizontally, to form a support for the rails; to the upper portion of these rails, as bent, was to be attached a brace or bracket, to which the angle iron which was to form the slot of the tube was fastened; these frames or ribs to be placed at proper intervals apart on the line of the
93 proposed tube and connected by sheets of corrugated iron, and to have a backing of cement to form the sides and a solid cement foundation to form the bottom of the tube, in which cement these rails were to be imbedded? Now, I will ask you, Mr. Root, whether this description by Mr. Montague is correct or not.

A. I remember that Mr. Montague did testify in that interference case, but I don't remember now as to what he did testify to. If he did so testify I believe it is true.

X Q. 85. Can you describe the construction of the Sutter-street tube and road-bed?

A. Generally, yes. There are several kinds in it.

X Q. 86. Was your invention embodied in that roadway?

A. It is in some of it.

X Q. 87. What part of the road, and how is it constructed?

A. There is a part of it that has been built lately, which was built under license under the patents under suit, particularly the block from Larkin to Polk street or Sutter and on Polk street from Sutter to Post and on Post street from Polk to Larkin; also Pacific avenue, now being constructed.

X Q. 88. In all those portions concrete is now used?

A. Yes.

X Q. 89. Now, referring to the old part of the road put down in 1875 and '6, do you know if your invention is embodied in that part, the part where no concrete is used?

A. I don't think it is; but I don't think any portion of the Sutter-street cable road was constructed or commenced prior to 1876. The crossing of Kearney street was torn up on Fourth of July, 1876, and they had been working a few weeks before.

X Q. 90. In that old portion of the Sutter-street road is not
94 the tube or rope tunnels connected by members of the skeleton frame-work to the stringers which support the rails, these

rails being secured by bolts or spikes to said stringers so that the whole of the frame-work is connected and bound together with the tube?

A. It is only particularly so at this time; a large number of horizontal tie-rods connecting the stringer with the yoke have been put in within the last five years, but they do not support the stringers vertically or prevent it from settling relatively to the tube and slot.

Recess until 2 p. m.

By Mr. PARDY:

X Q. 91. There is, however, a connection between the tube itself and the rails, so that they are not separate and independent as in the Clay-street line?

A. They were just the same as the Clay-street road when constructed, but a large number of horizontal ties have been added since, as I have just stated.

X Q. 92. Do you mean to say that you know as a fact that the tube in the Sutter-street line was entirely disconnected from the rails, or the stringers carrying the rails, when it was first laid down?

A. I did not say it was entirely disconnected, but my recollection is that all those horizontal tie-rods have been added since the construction of the road, but those tie-rods, as they exist at present, don't hold the stringer in a fixed position relative to the slot and tube, but only tie horizontally.

X Q. 93. Do you know how the Geary-street road is constructed with reference to the subway?

A. Yes.

X Q. 94. Is there not a connection there between the tube and the outer rails so that the rails are tied together horizontally and bound to the tube and supported also vertically?

A. Yes.

95 X Q. 95. Is your invention involved in that form of construction exemplified in the Geary-street road?

(Objected — by counsel on the ground that it is not proper cross-examination and the matter sought to be elicited should have been brought out on direct examination when the witness was called on behalf of the respondent.)

A. Well, I will say that I don't know, for the reason that that is a matter of opinion.

X Q. 96. How is the Presidio & Ferries road constructed with regard to the subway; is there not an intimate connection made there between the tube and the rail, substantially in the manner as in the Geary street?

(Same objection.)

A. In the case of the Presidio road there is no vertical support whatever for the stringer and shut ties, except the natural earth or sand.

X Q. 97. But there is a connection between the rails and the tube, is there not, so that you could not move one without the other?

A. You could raise the stringer three or four inches without affecting the tube at all.

X Q. 98. You could not move it sidewise, could you?

A. No; probably not.

X Q. 99. Is your invention involved in that form of construction?

(Same objection.)

A. I don't think so.

X Q. 100. Now, as to the Clay-street hill extension, is there not an intimate connection in that particular case between the whole of the members of the skeleton frame of the tube, so that the slot iron and the rails and the yoke and the tube are immovable with relation to each other, and can any settling or spreading apart of the structure occur?

96 A. That is true, with the exception of the tube. Sections of that tube might be removed altogether without destroying that structure or seriously impairing the strength and its efficiency.

X Q. 101. All the parts in that form of construction necessary to be bound and held together to prevent spreading apart or settling are so held, are they not, in the Clay-street hill construction?

A. Yes, I believe so, with the exceptions which I have just stated.

X Q. 102. Is your invention involved in the form of construction of the Clay-street hill extension?

A. I don't think so; it may be, however.

X Q. 103. You state that you had a model made in 1876, which was partly constructed at the Hope iron works and was finished at Fourth and Townsend streets; was Mr. Eppelsheimer present during the construction of that model?

A. Part of the time.

X Q. 104. Did you instruct Mr. Eppelsheimer or request him to make for you a drawing or sketch to illustrate that model?

A. I think not; I have no recollection of that kind.

X Q. 105. Did you not so state in your examination in the interference suit between yourself and Mr. Eppelsheimer heretofore mentioned?

A. I don't think I did.

X Q. 106. I will now read you question and answer 42 of your testimony taken at that interference proceeding:

"Did you make any sketches for him at that time; and, if so, for what purposes? A. I marked out the form in which I proposed to bend the rails and asked him to give me the size of the tube that would be required if his grip was used, as his principal argument in favor of his grip was that it would cheapen the cost of con-

97 struction by reducing the size of the tube. He said he would do so or make me a sketch showing the size of the tube required. I never saw that plan after that time—I mean the plan which was brought by Mr. Eppelsheimer."

Now, Mr. Root, do you remember that plan?

A. The plan referred to in that matter has nothing to do with this case; the testimony in that case is all true.

X Q. 107. You remember that plan, don't you?

A. I think the plan referred to there was the plan of a grip. It had nothing to do with this case. I think that was the first and last time I saw it.

X Q. 108. At the time you were having constructed the model before mentioned, did not Mr. Eppelsheimer make some drawings or sketches that were taken by him to the Hope iron works and there used in the construction of the model?

A. He might have made some sketches at that time, but I think if he did so they were nothing more than an outline for a tube; but whether he took them to the Hope iron works or not I have no recollection.

X Q. 109. Do you remember how many visits Eppelsheimer made to the Hope iron works during the construction of that model?

A. No, I don't remember; probably two or three.

X Q. 110. Did he not continue to make visits to Fourth and Townsend streets when the model was being finished?

A. I don't think he did. I don't think he came there at all after the skeleton iron-work was brought to the yard.

X Q. 111. Did Mr. Eppelsheimer ever exhibit to you a drawing of the tube substantially like the one patented in 1877?

A. He did not. He might have shown me, and I think he did at some time, a plan like one side of a patent which he obtained in 1877, which is probably the patent you refer to.

98 X Q. 112. I now show you an office copy of Mr. Eppelsheimer's patent No. 193,757 and dated July 31, 1877, and will ask you if the form of construction illustrated in that patent substantially conforms to any drawing Mr. Eppelsheimer may have shown to you in the year 1876.

A. There is one-half—the right-hand half of the figures which represents a form of construction having some similarity to a drawing which I saw Mr. Eppelsheimer have at some time later than the 27th day of September, 1876; either the last months of that year or early in 1877.

X Q. 113. Do you remember if you saw that drawing in Mr. Montague's office when Mr. Montague was present and at the time that you first met Mr. Eppelsheimer?

A. Very likely it was in Mr. Montague's office, but I think it was some time after I met Mr. Eppelsheimer first; however, I am not certain about that.

X Q. 114. After the finishing of the California-street road, how long was it before you commenced the design for the Market-street road or system of road?

A. I don't think there was any particular time; we were working at it nearly continuously, with intermissions, up to the time work was commenced in 1882—I mean the details of the design of the Market-street construction, changing and making models, etc.

X Q. 115. You had a draughting force of one or two men?

A. Yes; one man did most of the draughting. We also had a model-maker and his assistant.

X Q. 116. Did you commence designs for the Market-street subway immediately after the finishing of the California-street work? State as near as you can when you did commence that design.

99 A. Not with the subway. I think we did some work on the design and models of driving machinery, terminal devices, cars and grips, extending through the years 1879, 1880, and 1881. I don't think there was anything done in track or subway plans until about the beginning of the year 1881.

X Q. 117. When was it you first saw or heard of the Eppelsheimer patent above quoted?

A. I cannot remember.

X Q. 118. Did you know of its existence in 1877?

A. I don't think I did.

X Q. 119. You keep a memorandum in relation to cable patents, do you not?

A. I do now; I did not then.

X Q. 120. Can you state any date when you had seen or heard of the Eppelsheimer patent? And, if so, state the earliest one.

A. Well, I saw it prior to the year 1883.

X Q. 121. When did you first see Mr. Holmes in this town, of the Chicago city cable road?

A. I think it was during the first half of the year 1881.

X Q. 122. You had some conversation with him at that time as to the construction of cable railways, did you not?

A. Yes.

X Q. 123. He consulted with you in regard to the construction of the subway particularly, did he not?

A. Probably talked over everything in regard to cable matters.

X Q. 124. Do you remember recommending to him any particular form of construction for adoption in his proposed Chicago road?

A. I don't remember any particular thing that I said to him; but I probably did recommend such a construction in case they built such a road.

100 X Q. 125. Do you know if he followed your advice with regard to the general construction of the subway in the Chicago structure afterwards built?

A. Yes; he did.

X Q. 126. That structure in Chicago is formed of bent wrought-iron ribs and concrete, is it not?

A. It is.

X Q. 127. Essentially similar to the construction on California street?

A. Yes.

X Q. 127½. What expenditure, if you know, about did that Chicago enterprise entail?

A. The first portion of the road was put in operation for the first time about 18th of February, 1882, and I was told by Mr. Holmes in May, 1882, that the cost up to that date had been about two and a half million of dollars, and I think nearly as much more has been

expended by that company on other cable lines of the same character.

X Q. 128. Did you ever consult with Mr. Holmes or any other person on behalf of his company, directly or indirectly, before you met him here in this city?

A. Not that I have any recollection of. I know at the time of his first visit here it was not settled for a certainty that his stockholders would consent to the large expenditure of money necessary for the construction of a substantially built cable road, and I saw by the papers soon after his return to Chicago that the whole project had been abandoned; but it did finally go ahead during the latter part of the year 1881, and was completed, as I have said, about February 18, 1882.

X Q. 129. Do you know Mr. A. E. Hovey, who assisted in building the Sutter-street line and afterwards was employed in designing the details of this Chicago road?

A. Yes.

101 X Q. 130. Can you state in what year he became connected with the Chicago enterprise?

A. I think it was 1881.

X Q. 132. Are you sure of the date being 1881?

A. Yes; I have no record before me, but that is my recollection of it.

X Q. 133. Did not Mr. Hovey consult with you in regard to the Chicago proposition for a railroad?

A. Yes, he talked to me about it.

X Q. 134. And he adopted the form of concrete and iron subway which they afterwards employed?

A. He had very little to say about it; he merely did as he was told.

Adjourned to 10.30 a. m. on Saturday, April 21, 1888, at the same place.

SAN FRANCISCO, CAL., SATURDAY, *April* 21, 1888.

Met pursuant to adjournment at the office of Wm. Booth, 220 Market street.

Present: Wm. F. Booth, Esq., of counsel for complainant; George Pardy, Esq., representing J. H. Dickinson, Esq., of counsel for respondent, and the witness HENRY ROOT, whose examination was continued as follows:

By Mr. PARDY:

X Q. 135. I will ask you if you have any recollection of consulting with Mr. Hovey in the year 1878 in regard to a design suitable for the road-bed of the Chicago enterprise.

A. I have no recollection of anything of the kind and I am certain nothing of the kind occurred.

X Q. 136. Were there not some drawings and some models made here in this city for the proposed Chicago road of which you had knowledge?

A. Not in the year 1878.

102 X Q. 137. What year was it, then, according to your recollection?

A. About the year 1881 or possibly the last part of 1880.

X Q. 138. What was the nature of those drawings?

A. What drawings?

X Q. 139. The drawings you have referred to?

A. I have not referred to any drawings. I have no recollection of any particular drawing or drawings; but I know about the time I have mentioned I had considerable talk with Mr. Hovey about cable-road matters in general, and, I think, the Chicago road amongst the rest, and I might have seen some drawings about that time of which I have no recollection now.

X Q. 140. Did you ever see a large full-sized wooden model of a gripping apparatus Mr. Hovey had made for the purposes of this Chicago road here in this city?

A. I saw such a model in Hovey's possession in Chicago about the first of May, 1882, and I might have seen it here in San Francisco previous to that time, but I cannot tell for certain whether I did or not.

X Q. 141. Do you know if that model was made in this city before Hovey left here?

A. I believe it was, but I cannot tell for certain unless I saw it.

X Q. 142. Do you know if Mr. Hovey was working on designs for the Chicago road before he left here?

A. I think he was—but a short time, though. He was working on general cable railroad inventions for a long time before.

X Q. 143. How long was it, if you know, from the time that the Chicago road was first proposed to the time that they commenced to build? I understand you to have said that there was a period that the enterprise laid idle.

103 A. I have no exact information on that point, but I think seven or eight months.

X Q. 144. Do you not remember when the Chicago road was first proposed that estimates of costs were prepared and general designs approved of?

A. No; I don't remember anything of the kind. I don't think any detailed estimates ever were made prior to the commencement of the work.

X Q. 145. You state, in your testimony, that doubts were expressed as to the permanency or reliability of the California-street form of tube. Were any doubts expressed by you to your principals in regard to its practicability?

A. Not that I remember of. I don't think I would have been likely to have expressed my doubts.

X Q. 146. You never told Gov. Stanford, whom you say owned nine-tenths of the stock, that there were any chances of the failure of the California-street subway, or suggested to him that the laying down of that road should be viewed in the light of an experiment, did you?

A. The whole matter was talked over thoroughly, but I don't

think I told Gov. Stanford how he should view it. I merely gave him the facts, and only gave my opinion when it was asked for.

X Q. 147. Then Gov. Stanford directed you, did he not, to put down the subway constructed as it now is?

A. He did not give me any directions about the plan of construction; he merely told me to go ahead with that plan as I proposed.

X Q. 148. He knew fully, did he not, the details of the plan?

A. He knew the general plan, not the minute details.

X Q. 149. And he told you that he approved of it, and you put it in practice under his orders, did you not?

104 A. I don't know as he ever told me that he approved of it, but I understood that he did from the fact that he told me to go ahead with the construction of the road.

X Q. 150. And the total cost of the road was $418,000?

A. Yes; including everything.

X Q. 151. What is the cost of a patent application, about?

A. From $75 up, according to the talent employed.

Redirect examination by Mr. BOOTH:

Q. 152. In the construction of the subway of the Geary-street road was concrete employed?

A. No; it was not.

Q. 153. Do you know when the Geary-street road opened?

A. The 16th February, 1880.

Q. 154. On cross-examination you were asked as follows:

"Cross-question 82. Suppose I were to take an old rail, bend it down in the centre, put it under the tube as it now exists on, say, the Clay-street hill road, support the rails thereupon and put an underlying bed on concrete in connection therewith, would that of itself be such a novelty of construction as to involve an invention?"

And you answered as follows:

"It would certainly not be new at this time, and I don't know as there would be any novelty in that at any time."

Do you wish to explain this answer?

A. I did not get the whole of that question which you refer to. So far as the first part of the answer is concerned it is all right, but if a bent rail was used as described to support the rails of the Clay-street road together with concrete, it would change the whole

105 character of the structure, and, in my opinion, would have been new prior to my invention embodied in the patent now in suit.

Q. 155. What part of cross-question No. 82 referred to was it that you did not get and the failure to get which caused you to give the answer you did give?

A. The support of the rails of the Clay-street track and the concrete.

(Signed) HENRY ROOT.

Adjourned to Monday, April 23, 1888, at the same place, at 10 o'clock a. m.

Office of Wm. F. Booth, 220 Market street.

SAN FRANCISCO, CAL., MONDAY, *April* 23, 1888.

Met pursuant to adjournment.

Present: Wm. F. Booth, Esq., of counsel for complainant; Geo Pardy, Esq., representing J. H. Dickinson, Esq., of counsel for respondent.

Mr. Booth stated that he desired to examine Mr. Wm. H. Birch, one of the persons named in the accompanying notice, but that Mr. Birch was confined to his house by a severe attack of pneumonia, from which he was recovering, and asked that adjournment be had from day to day until such time as the witness was able to appear. Mr. Pardy assenting to this, adjournment was taken until Tuesday, April 24, 1888, at the same place, at 10 o'clock a. m.

TUESDAY, *April* 24, 1888.

Met pursuant to adjournment at office of Wm. F. Booth, Esq.

Present: Wm. F. Booth, of counsel for complainant, and Geo. Pardy, of counsel for respondent.

Mr. Booth stated that the witness, Birch, was still too un-
106 well to appear, and that the witness, Charles Crocker, was likewise unwell, and asked adjournment be taken until Wednesday, April 25, 1888, at the same place, at 10 o'clock a. m.

WEDNESDAY, *April* 25, 1888.

Met pursuant to adjournment at the office of Wm. F. Booth, 220 Market street, San Francisco.

Present: Wm. F. Booth, Esq., of counsel for complainant, and Geo. Pardy, Esq., of counsel for respondent.

Mr. Booth stated that both the witnesses, Crocker and Birch, were still too unwell to appear and testify in this case, and that their illness was of such nature that no reasonable time could be fixed for their recovery, and therefore requested the notary taking the testimony to close the case, which was so done.

STATE OF CALIFORNIA,
*City and County of San Francisco,* } ss:

I, Holland Smith, a notary public in and for the city and county of San Francisco, State of California, do hereby certify that the foregoing depositions of John J. Haley, Peter H. Jackson, Andrew S. Hallidie, L. B. Benchley, Henry L. Davis, and Henry Root were taken before me on behalf of Henry Root, the complainant in a civil cause in the circuit court of the United States for the southern district of New York, held at New York, in said district, on the equity side of said court, wherein the said Henry Root is complainant and The Third Avenue Railroad Company is respondent,
in an action for infringement of patent; that said depositions
107 were taken in pursuance of the notices hereto annexed; that the reason for taking said depositions was and is and the fact was and is that each of said deponents lives at a greater distance from New York, the place of trial of the said civil cause, than

one hundred (100) miles, to wit, in San Francisco, Cal.; that said depositions were taken at the office of William F. Booth, Esq., No. 220 Market street, in the city and county of San Francisco, on the fourteenth day of April, A. D. one thousand eight hundred and eighty-eight, and pursuant to adjournment on the sixteenth, seventeenth, eighteenth, nineteenth, twentieth, twenty-first, twenty-third, twenty-fourth, and twenty-fifth days of said month of April.

That each of said deponents was by me duly cautioned and sworn to testify the whole truth before the commencement of his testimony, and each was carefully examined; that the testimony of each of said witnesses was then and there reduced to writing by me and by no other person, and that each of said witnesses subscribed his testimony after it had been so reduced to writing; that the complainant, to wit, Henry Root, was represented by William F. Booth, Esq., of counsel, and the respondent, to wit, Third Avenue Railroad Co., was represented by J. H. Dickinson, Esq., of counsel; that said testimony was commenced at ten o'clock a. m. on the fourteenth day of April, A. D. 1888, and was continued pursuant to adjournment on the sixteenth, seventeenth, eighteenth, nineteenth, twentieth, twenty-first, twenty-third, and twenty-fourth, and was concluded on the twenty-fifth day of said month.

That it being impracticable for me to deliver said depositions with my own hand into the court for which they were taken, I have retained the same for the purpose of being sealed up by me and speedily and safely transmitted by the United States mail to the said court for which they were taken, and to remain under
108 my seal until there opened; that I am not of counsel or attorney to either of the parties, nor interested in the event of the cause; that the fees for taking said depositions amount to $100, and that the same is just and reasonable for the services performed and has been paid me by complainant.

In testimony whereof I have hereunto set my hand and affixed my seal of office, at the city and county of San Francisco, this twenty-fifth (25) day of April, A. D. one thousand eight hundred and eighty-eight.

HOLLAND SMITH,
*Notary Public.*

[NOTARIAL SEAL.]

109 United States Circuit Court, Southern District of New York.

HENRY ROOT, Complainant,
*vs.*
THIRD AVENUE RAILROAD COMPANY, Respondent.

In Equity. No. 3866. Conduit Case.

Please take notice that the depositions *de bene esse* of the following witnesses in behalf of the complainant in the above-entitled suit will be taken before Holland Smith, a notary public, at the office of William F. Booth, 220 Market street, San Francisco, California, on Saturday, April 14, 1888, at ten o'clock in the forenoon. The depositions will be continued from day to day until completed. You are invited to attend and cross-examine, if you so desire. The following witnesses will be examined:

A. S. Hallidie, 329 Market street, San Francisco, California; Joseph Britton, 829 Union street, San Francisco, California; Henry L. Davis, 329 Market street, San Francisco, California; John J. Haley, N. cor. 4th and Townsend Sts., San Francisco, California; L. B. Benchley, 202 Market street, San Francisco, California; Henry Root, 712 Sutter street, San Francisco, California; Wm. H. Birch, 119 Beale street, San Francisco, California; Peter H. Jackson,
110 N. W. cor. Fremont and Mission streets, San Francisco, California; Geo. E. Dow, 114 Beale street, San Francisco, California; Charles Crocker, N. cor. 4th and Townsend sts., San Francisco, California.

Dated March 27, 1888. GEORGE HARDING,
*Solicitor for Complainant.*

To Messrs. Hoadly, Lauterbach and Johnson, solicitors for respondent.

111 United States Circuit Court, Southern District of New York.

HENRY ROOT, Complainant,
*vs.*
THIRD AVENUE RAILROAD COMPANY. } In Equity. No. 3866.

Testimony in rebuttal on behalf of complainant taken before Samuel Bell, Esq., a commissioner of the circuit court of the United States in and for the eastern district of Pennsylvania, stipulated examiner, pursuant to notice, at the office of George Harding, Esq., No. 901 Walnut street, in the city of Philadelphia, Pennsylvania, on the second day of July, A. D. 1888, at 10 o'clock a. m., and on subsequent days by adjournment.

Present: George J. Harding, Esq., for complainant; Harry E. Knight, Esq., for respondent.

Adjourned to meet July 3d, 1888, at 10 o'clock a. m.

JULY 3, 1888.

Met, pursuant to adjournment, at 10 o'clock a. m.
Present: George J. Harding, Esq., for complainant; Harry E. Knight, Esq., for respondent.

Adjourned to meet July 5, 1888, at 10 o'clock a. m.

112 JULY 5, 1888.

Met, pursuant to adjournment, at 10 o'clock a. m.
Present: George J. Harding, Esq., for complainant; Harry E. Knight, Esq., for respondent.

Adjourned to meet July 6, 1888, at 10 o'clock a. m.

JULY 6, 1888.

Met, pursuant to adjournment, at 10 o'clock a. m.
Present: George J. Harding, Esq., for complainant; Harry E. Knight, Esq., for respondent.

Adjourned to meet July 7, 1888, at 10 o'clock a. m.

JULY 7, 1888.

Met, pursuant to adjournment, at 10 o'clock a. m.

Present: George J. Harding, Esq., for complainant; Harry E. Knight, Esq., for respondent.

Adjourned to meet Monday, July 9, 1888, at 10 o'clock a. m.

JULY 9, 1888.

Met, pursuant to adjournment, at 10 o'clock a. m.

Present: George J. Harding, Esq., for complainant; Harry E. Knight, Esq., for respondent.

Q. 1. You are the same Rudolph M. Hunter who has heretofore testified in this cause in behalf of the complainant?

A. Yes, sir.

Q. 2. Have you read over and do you understand the examination of Mr. Octavius Knight, expert for respondent in this case?

A. I have read his testimony and believe I understand the same.

113 Q. 3. Have you read over and do you understand the evidence taken on behalf of respondents before Holland Smith, at San Francisco, California?

A. I have, and believe I understand the same.

Q. 4. Have you read and do you understand the evidence of Mr. John Bogart, a witness produced on behalf of respondent in this case?

A. I have, and believe I understand the same.

Q. 5. Have you read and do you understand the various letters patent, both American and English, which were referred to by Mr. Octavius Knight in his evidence and which appears as exhibits on behalf of respondent in this case?

A. I have, and believe I understand the constructions and devices set out therein and claimed.

Q. 6. Please look at English patent No. 1581 of 1876 and state whether you find in that patent described, illustrated, or claimed anything which will cause you to modify your views heretofore given in this case in relation to the patent in this suit and the invention therein described and claimed; also please point out any points of difference you may find between said exhibit and the patent in suit; also please state whether you agree with Mr. Knight where he says that in English patent No. 1581 of 1876 "a complete disclosure and description of the use of concrete as a foundation for cable railway is found" * * * "in this the cable-way is formed within a slotted rail, and the specification says that the rails are bedded on the same concrete foundation on which the pavement sets."

A. I have carefully considered English patent 1581 referred to, and find nothing therein which would in anywise cause me to modify or change any views which I have expressed in my previous evidence in relation to the invention set out and claimed in the Root patent in suit.

114 The inventions disclosed in the English patent referred to relate to the propulsion of cars, and several means for pro-

pelling the cars are disclosed in the said patent, the most important of which is a method in which a rapidly travelling cable, contained in a shallow iron trough formed in the groove of the rail of the tramway, is caused to impart rotation to a system of gearing upon the car, and whereby a reduced speed is imparted to said car; the cable is lifted through the slot of the trough or rail and caused to pass between two rollers, and causing them to rotate by means of friction. One of these rollers is connected through suitable shafts and gearing with each axle of the car and so as to drive them in opposite directions, and clutches are employed to throw either of said systems of gearing out of action, so that with the cable running constantly in the same direction the tram-car may be caused to travel in either direction—that is to say, with the cable or in the opposite direction to the movement of the cable. In this construction it is evident that the car is not positively dragged over the tramway, as in the case of the defendant's railway and that to be used in connection with complainant's conduit structure in suit, but relies upon the adhesion of the wheels upon the rails, as in the case of any steam locomotive, to impart the necessary movement to the car. This, then, is not a cable railway of the kind commonly in use and employed by the complainant or the defendant, in which the cars are dragged over all obstructions and caused to ride more or less heavily upon the rails, producing a pounding action which is liable to displace the rails or cause them to set unequally with the ordinary road-bed structures in use with street railways. In the English patent referred to there is no undue strain upon the railway tracks, owing to the peculiar method of driving the car. Furthermore, it will be observed that inasmuch as there is no
115 gripping device extending down into the conduit, but instead the cable is lifted out of the conduit into the friction driving rollers, the trough to contain the cable may be exceedingly small, and, inasmuch as it is formed within the rail of the tramway, the entire structure throughout its length is of metal. This structure is clearly shown in figures 1, 2, and 3 of the patent. If we consider the wheels shown being 30 inches in diameter it will be noticed that the cable trough is only about 10 inches in depth. From the nature of the construction, this trough, in fact, forms the rail itself.

The provisional specification of this patent, 1581, states:

"The first part of the invention consists in a new form of rail or plate (checkered on the tread to give horses foot-hold), which is bedded on the same concrete foundation as the pavement sets. The depth of the groove in which the flanges of the wheels run is sufficient to contain a light endless rope or chain running on bearings and guide rollers at intervals."

This shows two things, viz., first, that the two rails are to be supported upon the same concrete upon which the pavement rests; and, secondly, that the only conduit or trough for the cable is an enlargement of the grooves of the rails in which the flanges of the wheels of the car run. It will thus be seen that we have two peculiarly shaped or deeply grooved rails. An examination of the drawings and specifications shows that these deeply grooved rails have no

connecting tie, but each rest independently upon different portions of concrete. Furthermore, it will be observed, by examining Fig. 3 of the patent, that these grooved rails simply rest upon the concrete and are not even bound together through the mediation of such concrete. Even if we were to consider that one of the rails was

116 a combination of a rope conduit and one rail of the tramway, we would still have no connection by a tie or other metallic bracing with the other rail of the tramway, and consequently we cannot find in this patent the feature of complainant's patent in which the two rails are tied together by means of metallic ties and such iron-work embedded on concrete foundations. Furthermore, I fail to find in this patent any ties whatever, and likewise I fail to find the existence of a tube or conduit to contain the cable formed of concrete, either separately or in connection with a tie or the rails.

For these reasons I do not agree with Mr. Knight in his statement that a complete disclosure and description of the use of concrete as a foundation for cable railways is found in this patent, where the implication, in his language, is that what is shown in this patent is the foundation set out and claimed in connection with the ties of the Root patent in suit. It is true that concrete is used upon which to lay the rails and paving stones; but it is not true that such concrete is the same as the "foundation concrete" of the Root patent, for that concrete, claimed in claims one and two, relates to the foundations of the track-supporting ties, and which, as I have before stated, do not exist in English patent 1581.

This English patent also sets out a number of other methods of propelling the cars and increasing the adhesion between the wheels and the rails, and in the substitute methods the employment of the cable and deeply slotted rail are dispensed with and steam power substituted.

In conclusion, I would say that I find nothing whatever in this English patent which corresponds to the structure set out and claimed in the Root patent in suit.

117 Q. 7. Will you please look at English old law patent No. 10606, A. D. 1845, and state whether you find in said letters patent anything which will cause you to change your prior evidence in relation to what is described and claimed in the Root patent in suit; also please state whether you agree or disagree with Mr. Knight in reference to his conclusions upon said letters patent, which are set out in his evidence given in this case.

A. I have examined the letters patent referred to in the question and do not find therein anything which will cause me to modify or change my previous evidence given in this suit.

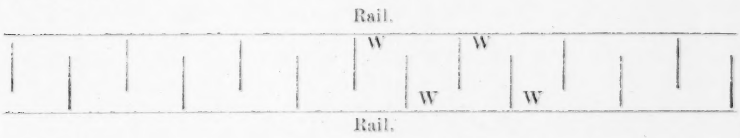
The device set out in this English patent relates to cable railways in which an endless rope or cable is not used, but, instead, two separate and distinct cables cause to travel alternately in opposite directions, and which, through the mediation of differential rollers carried by a traction carriage, and cause it to be propelled and pull a passenger coach upon a separate and distinct railway arranged either to one side and parallel to the traction-carriage rails or arranged so as to include the traction-carriage rails between the

rails for the passenger carriage. From the construction of the device set out in this patent it will be observed that there is no conduit whatever. In Figs. 1, 2, 3, and 5 the cable travels at the surface and on a level with the rails, and in Fig. 4 we have the earth between the rails and their stringers somewhat removed to form a sort of trough, not because it is desired to arrange the cables therein, but because it is desired to lower the mechanism of the traction carriage sufficiently to pass under the axles of the passenger carriage. To accomplish this the inventor states: "In this case it is necessary to lay the sleepers in the manner shown at W W and to lay the ballasting so as to cause its surface to form a channel coin-
118 ciding with the upper surface of the sleeper. This channel would give the required room for the differential pulleys when arranged, as shown in the diagrams." This description is found on page 5, beginning with line 20, and refers to Fig. 4. The parts which he terms sleepers, W W, are the oblique pieces of wood there shown and upon which the respective rails' stringers rest. There is nothing in the specification or drawing to indicate that the parts marked W W are in anywise united, and, as shown, they may be considered as independent of each other and surrounded on the sides and bottom by ballasting, which, in railroad work, is supposed to be rough-broken stone, gravel, or other tightly packed earth foundation. Ballasting does not imply concrete, and if concrete were intended to be used the specification would have so stated. No ballasting is shown in Fig. 4, and consequently, as no means is shown for uniting the parts W W, I assume that they are not located in the same plane, but those under each stringer are arranged alternately at different places along the railway; or, in other words, they are staggard.

At 1 p. m. recess until 2 p. m.
At 2 p. m. met pursuant to adjournment.
Present: As before.

Mr. HUNTER, the witness, resumes:

This would appear, upon looking down upon it, somewhat similar to a ladder if the rounds were alternately severed from the two side bars thus:




(The witness makes the above drawing.)

119 From this it will be observed that the rails and their supporting stringers are in nowise connected together by a continuous tie, and such disconnected pieces W as do exist in this English patent are not embedded in concrete nor have they a concrete foundation of any sort. The parts W W are embedded in ordinary

ballast just as any common railroad sleeper is embedded in the ballast of the road-bed. It is true that the upper edges of the parts W W are exposed, but in this they do not differ from the ordinary railroad sleepers or cross-ties in general use. There certainly is no concrete or other conduit, no slot irons, and no connecting tie of the character set out in the Root patent in suit for connecting the two rails and supporting slot irons, nor such a tie embedded in concrete foundations, nor a tube of concrete or other substance to form a monolythic structure between the rails and conduit.

For these reasons the structures set out in the English patent No. 10606 of 1845 has nothing in common with the structure disclosed in Complainant's Root Patent in suit, and the implication of defendant's expert Knight that the said parts W W correspond to Root's tie and the ballasting of said patent corresponds to Root's conduit and foundation concrete is unwarranted. I do not agree with him in his statement.

"This description in view of the common use of concrete for road-beds would naturally suggest to an engineer the use of concrete to form a cable conduit and road foundations and the combination therewith of ties connecting the track rails so as to prevent their relative movement;" because there is no conduit shown or suggested in the patent, there are no connecting ties between the rails described or clearly illustrated, and there is no necessity for the employment of concrete in the structure shown.

Q. 8. Please examine English old law patent 11274 of
120 1846 and answer the same questions in reference to that as are set out in the last question in reference to English old law patent No. 10606 of 1845.

A. I have examined the English patent referred to and find nothing therein set out which would in anywise cause me to modify or change my previous evidence in this case.

The invention or inventions disclosed in the English patent referred to relate to the construction of railways and the means of giving motion to locomotive carriages. The construction of road-bed in some parts consists of longitudinal stringers provided at close intervals with supporting rollers upon which the platform cars "without wheels" run. Between these wheels, of which there are two parallel rows, is arranged a stationary cable rope or chain which is brought up around a drum on one of the carriages, and by rotating said drum the said carriages are caused to travel over the supporting wheels. In the description relating to Figs. 20 and 21, showing a transfer track, we have two parallel longitudinal stringers of wood $Y^2$ embedded in separate masses of concrete $Z^2$, and which concrete does not extend the full width of the said railway. Upon these stringers loose rollers $A^3$ are laid extending from stringer to stringer, and upon these rollers the transfer carriages $B^3$ run. There are no cross-ties of any kind shown in these constructions and hence there can be no cross-ties embedded in concrete foundations. In this construction one stringer might readily settle with reference to the other and thereby cause inequalities in the road-bed. The supporting wheels or rollers for the wheelless carriages are all arranged

above the surface of the ground, and as shown in Fig. 1 the rope M simply rests upon the ground as is shown at each end of said figure. There is consequently no conduit of any kind and hence there can be no conduit of concrete or its equivalent, and from Fig. 20
121 and 21 it is clear that there is no roadway or paving supported upon the concrete. There is no doubt but that this patent shows the use of concrete under the stringers or rails upon which the rollers run in the case of the transfer track, but such concrete is not the concrete foundation nor conduit which are combined with suitable cross-ties for uniting the rail and slot irons with the conduit in a monolythic structure as set out in the Root patent in suit.

The construction of railway as set out in the English patent is entirely different in every respect from that contemplated in the Root patent in suit, and is one of *of* those impractical systems which could never be put into practice.

Q. 9. Please examine the following English patents, viz: No. 1269 of 1854, No. 2757 of 1859, No. 3173 of 1865, and answer, in relation to those patents, the same questions that are set out in question before last, 7, in reference to English old law patent No. 10606 of 1845.

A. I have examined the patents referred to and will consider them in the order named. The language of Mr. Knight, defendant's expert, when speaking of these patents is vague and indefinite and *are* apt to mislead any one reading them without closely examining the patents themselves. His use of the terms, conduit and foundations for railways, are apt to give the idea that they refer to conduit structures and foundations similar to those of the Root patent in suit, but they in reality refer to entirely different structures, for in no case do any of the patents cited disclose a slotted conduit adapted to cable railway purposes, nor foundations which support connecting ties for rails, and which ties are adapted to unite the rails and slot irons into a rigid structure with the concrete which forms an underground tube open at the top for the
122 entrance of the gripping device and in which the said tie and concrete foundation and tube are arranged below the surface of an ordinary street roadway. Mr. Knight had reference to pipes suitable for conveying water and wholly embedded in the earth and having no relation whatever to railways or to tunnels such as would be used in an atmospheric railway where brick and cement or grazed tiles, backed with concrete to make it, might be used. Referring first to patent No. 1269 of 1854, I find that it is entitled the "application of slates to the construction of conduit pipes." The invention set out in the patent consists in applying small slates laid in cylindrical form overlapping each other and cemented together to the construction of conduit pipes. The cement, which the inventor states he prefers, is the common asphalt. In making the combined cement and slate pipe the inventor binds the slate upon a cylindrical shell of iron and then surrounds it with a second shell, and after closing up one end with a cast-iron cap he turns it upon end and while it is heated to a temperature of about 230

degrees he pores in hot fluid asphalt, and when the asphalt is cold he strips off the inner and outer cylinders of sheet-iron, and for connecting with water pipes he heats a ring of iron and pushes it down around the outside of the asphalt pipe. This material can hardly be called concrete, though I notice that the word is used on page 4, line 9, in the following sentence:

"And make a solid concrete of the whole."

Such a substance as asphalte would always be subject to variations of temperature, and it would hardly be practicable to employ such a substance in place of concrete consisting of cement and broken stone. At best this patent simply shows a pipe formed of asphalt and slate with one or more rings of iron and is substantially similar to some of the constructions disclaimed in the
123 Root patent, page one, column two, last paragraph. There is nothing in this patent, 1269, either in general construction or in detail or in the materials employed or object in view, which corresponds in any manner with the invention set out and claimed in the Root patent in suit.

The English patent 2757 of 1859 is simply for an improvement in the manufacture of beton, or composition having lime for its base, which the patentee says may be used for various purposes, quite a number of which will be found on pages 9 and 10, of which I would refer to those marked 4 and 17 as bearing the nearest approach to the art to which the Root patent relates. The inventor, under No. 4, states that his beton may be used for "flagging for railway or monolythic surfaces, forming length and breadthwise permanent way, on which rails or other appliances may be fixed, wood sleepers and chairs being dispensed with." It will thus be noticed that when he supports the rails upon concrete the cross-ties or sleepers or chairs are entirely dispensed with, and, as there is no conduit, it is clear that there can be no similarity in this part of the invention *which* that set out in the Root patent, which employs the uniting the rails and a concrete-slotted conduit, in which the ties are embedded and upon which ties the rails are supported.

The matter under No. 17 is stated to be "monolythic roadways, the upper surface forming a road and the under surface an arched ceiling for a subterraneous road, longitudinal passages being provided in the thickness to form fluid-tight channels for gas, water, etc., instead of the tubes now used." From this it is evident that the inventor had in his mind, not a railway of any kind, but an ordinary roadway with a subterraneous tunnel, having no connection with the roadway and provided with water and gas pipes formed of the same material of which it is composed. There are no
124 rails and no connecting ties, and while the equivalent of concrete exist- it is not present as a foundation for the said ties.

For these reasons I fail to see that any matter disclosed in said English patent No. 2757 has any relevancy to the invention set out in the Root patent in suit, and most certainly does not illustrate any portion of the said Root invention.

Referring now to the English patent 3173 of 1865, I find that it relates to atmospheric railways and contemplates an air-tight

"tunnel or tube formed of any suitable material and of any convenient size, so as to allow the passenger carriage and luggage van to pass through." The front and rear of the train is provided with a diaphragm carriage, and through the mediation of the air pressure the train is propelled through the tunnel. Various constructions for the tunnel are given, some of which consist of a tunnel the lower surface of which is formed of metal, while the remainder of the tunnel is formed of various material.

"It may be formed of any available or suitable material, such as brick, stone, ashlar, or rubble."

This construction relates to a tunnel supported above the surface of the ground and having a metallic lower surface. When the inventor places the tunnel in the ground the metal may be omitted, and the tunnel is constructed in the ordinary manner; for instance, on page 23, beginning with line 5, he says:

"I prefer to construct the tunnel of stone, brick, and cement or glazed tiles backed with concrete."

There is no slotted conduit contemplated in the invention set out in this patent, and none is required, as the road is not a street or surface railway such as is contemplated in the Root patent.

Adjourned to meet Tuesday, July 10, 1888, at 10 o'clock a. m.

125 JULY 10, 1888.

Met, pursuant to adjournment, at 10 o'clock a. m.

Present: George J. Harding, Esq., for complaintant.

Mr. HUNTER, the witness, resumes:

In Fig. 16 of this English patent we have the tunnel made entirely of stone or brick work, with a central rail in the lower part of the tunnel, supported upon longitudinal stringers of wood set upon stone and bolted thereto. The car in this case has central supporting wheels. In this construction no iron-work enters into the tunnel structure.

In the construction shown in Fig. 17 the tunnel is formed entirely of cast iron, with a central rail longitudinally on its bottom or invert portion and a second guide-rail at its soffit or crown portion.

In the construction referred to in Fig. 5 the tunnel is formed of malleable iron rings with interposed sections of wood or other suitable material.

In none of these constructions do we find a slotted conduit, nor slot irons, nor two rails connected by ties embedded in concrete foundations, nor the use of concrete as a foundation structure, except in the most indefinite manner, where it states that the tunnel may rest on concrete. There is nothing whatever to show that the concrete is continuous, and on page 5, lines 5 and 6, I find the words "in concrete cast in five feet lengths." I do not find any of the element- which make up the invention set out in the Root patent in suit in this English patent. Indeed, all that is described or shown is a tunnel composed entirely of metal or partly of metal and partly of some other material.

Q. 10. Please examine U. S. letters patent granted to Henry Knight, of Brooklyn, New York, 38112, granted April 7, 1863, and answer the same questions in reference to that patent that
126 were put in question 7 in reference to English old law patent No. 10606 of 1845.

A. I have examined the patent referred to and find that it relates simply to tubes or drain tiles and consist in the formation of such a tube or tile of a metal pipe, coated upon its inside and outside with hydraulic cement or mortar, and provided with one or more cast-iron portions for making pipe connections therewith. At a glance Fig. 2 of this drawing might appear to be a slotted conduit, but this is not so, as the part which looks like the slot is simply a hole bored through on the dotted line *x x* of Fig. 1. This construction is to produce short sections of pipe adapted to be coupled together by suitable socket joints, and are intended to convey water through the streets. There are no rails or slotted conduit, nor slot irons, nor ties, nor foundations for such ties, either separately or combined, and hence the said patent, in my opinion, has no reference whatever to the invention set out and claimed in the Root patent in suit.

Q. 11. The same question repeated in reference to letters patent to Lyman A. Gouch, No. 161,222, March 23, 1875.

A. An examination of that patent shows that it relates to sewers in the ground and *have* no connection with the surface of the roadway. The construction set out in this patent is one in which a continuous girder — made up in sections bolted together and with interposed packings of rubber, so as to form a V-shape gutter, and which girder supports the upper part of the sewer or tunnel, which is made arched shape and formed of masonry. The patentee says:

"The invention consists in a sewer constructed in part of masonry and in part of iron, the masonry being in the form of an arch and resting upon an iron girder of novel construction, forming the bottom of the sewer."

127 This patent has no reference whatever to cable railways, and has not a road-bed with rails nor a slotted conduit nor a tie connecting the rails nor concrete foundations of any sort, and hence I fail to perceive that it has any reference whatever to the invention set out and claimed in the Root patent in suit.

Q. 12. And now will you please examine letters patent granted to A. S. Hallidie, No. 182,663, September 26, 1876, and answer the same questions in reference to that patent as are set out in question 7 in reference to English old law patent No. 10606 of 1845?

A. The Hallidie patent referred to simply shows a metal slotted conduit through which the rope travels and placed in the ground between the rails, which rest upon stringers and short sleepers for each stringer. There is nothing whatever in the patent to indicate to any one that either the tube or conduit itself or the surrounding foundations may be made of concrete; and as far as I can see from an examination of the said patent there is no concrete shown of any kind, but the iron tubes and rails, with their stringers and sleepers, are simply supported by the ordinary earth. So far as the patent

shows, there is no connection between the rails or rails and conduit, the sleepers there shown being of wood and extending part way towards the tube on each side, but having no connection with it, and in this construction it is self-evident that there is nothing whatever to prevent the rails and tube settling or becoming displaced relative to and independently of each other. For these reasons I fail to find the invention set out and claimed in the Root patent in suit in the Hallidie patent referred to in the question, and therefore disagree entirely with Mr. Knight in his direct evidence.

128 Q. 13. Please examine letters patent 101,174, March 22, 1870, granted to Charles Spear, and answer the same questions in reference to that patent as are set out in question 7 in reference to English old law patent No. 10606 of 1854.

A. The Spear patent referred to relates to the construction of submarine tunnels. The patent states: "My invention relates to submarine tunnels and other works of similar nature, and consists mainly in the construction and novel arrangement thereof, whereby a submarine structure may be formed of frame-work and concrete on land or on the surface of the water floated to its place of destination and sunk in position." The construction shown in the patent is one in which the tunnel is formed of a frame-work of wood with the spaces between the timbers and the entire outside of the tunnel provided with concrete. This tunnel, so formed, is shown as constituting two roadways for vehicles and two passenger walks on either side thereof. Such a tunnel is sunk to the bottom of the river and is entirely covered with water. In this patent it is evident that there is no cable railway construction whatever or any of the elements set out and claimed in the Root patent in suit beyond the existence of concrete. I therefore fail to find the invention set out and claimed in the Root patent in suit is shown in this patent to Spear.

Q. 14. Please examine letters patent 28069, granted to Samuel T. Fowler May 1, 1860, and answer the same questions in reference to that patent as are set out in question 7 in reference to English old law patent No. 10606 of 1845.

A. This patent, as Mr. Knight states, discloses wooden framework covered or embedded in concrete. It is essentially for house-building and is all above the surface of the ground, and has no relevancy whatever to cable railway structures, and hence cannot embody the invention set out in the Root patent in suit.

129 Q. 15. Please examine letters patent granted to James Stimpson, No. 1262, granted July 26, 1839, and answer the same questions in reference to that patent as are set out in question 7 in reference to English old law patent No. 10606 of 1845.

A. This Stimpson patent referred to relates to the construction of a railway adapted to steam, horses, or other power in which the cars are self-propelling. It consists of two longitudinal stringers, which are connected together at intervals by means of cast-iron cross-ties, upon which the rails are supported and by which they are connected together. Earth is then filled in over the stringers and around the cross-ties. There is no concrete used, nor is there a tube or tunnel

of any material, and consequently there is no connection between the rails and such a tube or tunnel. Neither is there a concrete foundation for the ties or the rails shown. I therefore fail to see that this patent embodies or has any relevancy to the invention set out and claimed in the Root patent in suit.

Q. 16. Please examine letters patent No. 197,376, granted March 23, 1858, to E. S. Gardiner, and answer the same questions in reference to that patent as are set out in question 7 in reference to English old law patent No. 10606 of 1845.

A. I have examined the Gardiner patent referred to and find that it relates to a street railroad employing a slotted conduit. The rails A are respectively supported upon independent longitudinal wooden stringers, B, of the ordinary construction. The conduit is independently built in the earth at a point between the rails, and, as shown, consist of two side stringers, *d*, with the upper-curved arched pieces, D $D^1$, which almost meet at the top so as to form the slot *e* along the roadway between the rails. An examination of this patent satisfies me that the side stringers, *d*, of the conduit are of
130 wood resting upon an earth foundation (the bottom of the trench), and with the upper-curved iron parts, D $D^1$, bolted upon the upper edges of the said stringers. The patent does not mention concrete or any equivalent, and evidently only contemplates the usual earth foundations. It is also clear that the rails and their stringers may settle or become displaced relatively to each other and to the conduit, and *vice versa*, as there is no connection whatever between them. There are no cross-ties of any kind, either with or without concrete or equivalent foundations, and as there is no concrete employed in the conduit the said Gardiner patent does not disclose the invention set out and claimed in the Root patent in suit, and neither does it indicate to an engineer that concrete or the other elements found in the Root patent might be employed.

At 1 p. m. recess until 2 o'clock p. m.

AT 2 P. M.

Met pursuant to adjournment.
Present: As before.

Mr. HUNTER, the witness, resumes:

Q. 17. Please examine the letters patent granted Abel Thompson, No. 131,913, dated October 1st, 1872, and answer the same question in reference to that patent as are set out in question seven in reference to English old law patent No. 10606 of 1845.

A. I have examined the said patent to Thompson and find that it relates to an alleged invention in which a car track is arranged upon the ordinary street and a large tunnel is arranged below the said track with a connecting slot from the top of said tunnel, whereby a connection may be made between the car and a steam locomotive adapted to travel within the conduit upon a second pair of
131 rails. It will be observed that the tunnel is wider than the gauge of the car track, and if we measure its height (taking the diameter of the car wheel at thirty inches, which is a common size)

we will find that it is sixteen feet, or sufficient for a locomotive to readily pass through the same. This alleged invention is one of those impracticable constructions which could never be put into use, for not only does the objection exist to the size of the tunnel to be used with a slotted top, but it would be impossible for an engineer to exist in the close, suffocating atmosphere of the tunnel necessarily produced by the escaping products of combustion and gases evolved from the locomotive, and such gases and smoke issuing from the slot into the street, which would be objectionable for many obvious reasons. Such a system as here disclosed could never come into use, and I understand has never been even tested. Aside from the impracticability of the alleged invention I find that the structure therein set out consist- of a series of metallic trusses, *h*, arranged transversely to the length of the tunnel and connected at the upper part by longitudinal bars *i*, passing from one truss to the next and forming the side walls of the slot *b*. These bars *i* are shown in Fig. 2, but are not shown in Figs. 1 and 3. Metal plates *k* are supposed to rest upon said bars and extend from truss to truss, and upon these plates a pavement of wood is laid. How this construction is actually carried out is not shown by the defective drawing forming part of the patent. The spaces between the trusses are filled with isolated walls *m* of brick-work, and there is no connection between the successive sections of the wall upon the one side of the tunnel, and from the construction of the truss shown there are no projections extending into the said walls. These walls *m* might be separately removed. These walls simply act as
132 retaining walls for the earth upon the outside. By examining Fig. 2 it will be observed that the upper parts of these trusses have lateral flanges which extend out and rest upon the tops of the walls *m*, and between the tops of the said walls and the bottom of the pavement supporting plates *k* (and bars *i*) are spaces which are not filled with anything, and consequently it is evident that the said walls cannot act as supports for the roadway pavement, as is the case in the construction in suit. In Figs. 1 and 2 the trusses are imperfectly shown, but do not appear to have any cross-piece on the bottom, being substantially similar to Fig. 3, with the entire bottom removed; and in these figures 1 and 2 the foundation is represented as sections or blocks of something (of what the patent does not state), which are arranged transversely like crossties of a railroad. In the construction shown in these figures there is nothing to prevent the two sides closing in and shutting up the slot. The rails for the cars above the tunnel are supported in some manner, but how the patent does not show or state. It is absolutely certain that in the constructions illustrated in figures 1 and 2 that there is no metallic connection whatever between the trusses *h* on each side of the slot or tunnel. The inventor adds a small figure, which he marks 3, and in general features I take it to be of the same construction as shown in figures 1 and 2, but with the bottom portions of the side parts of the truss united. If we were to suppose this truss to be placed in the tunnel shown in figures 1 and 2 we would still have all the features of construction set out, with the ex-

ception of the transverse metal connecting part of the truss extending below the tunnel rails, but how supported the patent does not say or show.

There is no hint in the patent that these trusses support the rail so as to prevent them from spreading, nor that such trusses are embedded in a foundation of concrete, nor that there is a con-
134 tinuous tube of concrete extending longitudinally below the car track, and the whole united into a monolythic structure in which no part can settle or be displaced relatively to the others, and it is perfectly evident that the trusses therein shown are practically different from the ties of the Root patent in suit, and it is also clear that there are no continuous slot irons such as contemplated in the Root patent. To make the difference in the relative constructions of the Root and Thompson tie or trusses apparent I have prepared a sketch illustrating the general construction of these two devices and have marked them with the respective names. Examining this drawing, it will be noted that there are no uprights c and transverse ties D of the Root tie found in the Thompson truss.

For these various reasons I fail to see that the matter disclosed in the Thompson patent contains the invention set out in the Root patent and forming the bases of the claims thereof.

(The sketch referred to by witness is offered in evidence, and the examiner is requested to mark the same "Complainant's Exhibit Hunter's Sketch, Comparison of Root Tie and Thompson Truss.")

(Here follows diagram marked p. 133.)

Q. 18. Have you read over the evidence taken in California in reference to the Clay-street hill extension and the construction of the conduit and the relation of the track, conduit slot iron, etc., one with the other? And, if yea, please state whether you find in said construction the construction set out and claimed in the Root patent in suit, and point out any points of resemblance and difference.

A. I have read over the evidence of the defendants and of the complainant in rebuttal relative to the Clay-street hill extension cable railway and believe I fully understand the same. My understanding of the construction of road-bed employed in the Clay-street hill extension is that there are cast-iron U-shaped
135 yokes arranged at short intervals apart in a trench formed in the roadway and united together by two longitudinal wooden stringers, the slot irons, and rails. The stringers are made in short sections arranged between successive yokes and support wooden pavement upon one side and between one rail and the adjacent slot iron. The space between the other rail and slot iron is filled in with a paving formed of longitudinal boards. The tunnel or tube is formed partly of concrete and partly by the yokes, the concrete extending between adjacent yokes, and each section so formed being independent and distinct from the other sections of concrete tube or tunnel. The concrete does not extend up to the roadway or paving, but leaves an interpose- space between the under part of the paving and

Henry Root
compl't.
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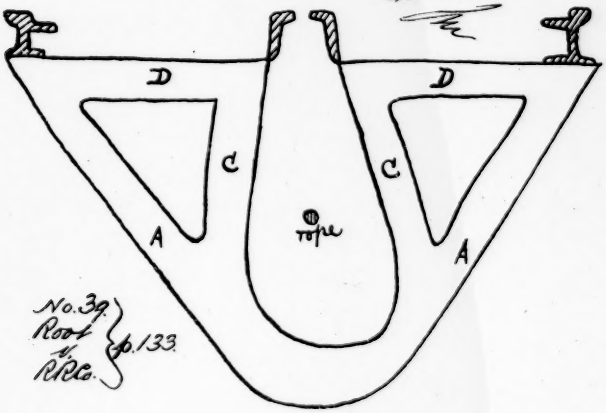
Southern Dist of N. Y.
In Equity
No 38,666

Complainants Exhibit

Hunter's sketch comparison of Root tie and Thompson truss.

Samuel Bell
Examiner

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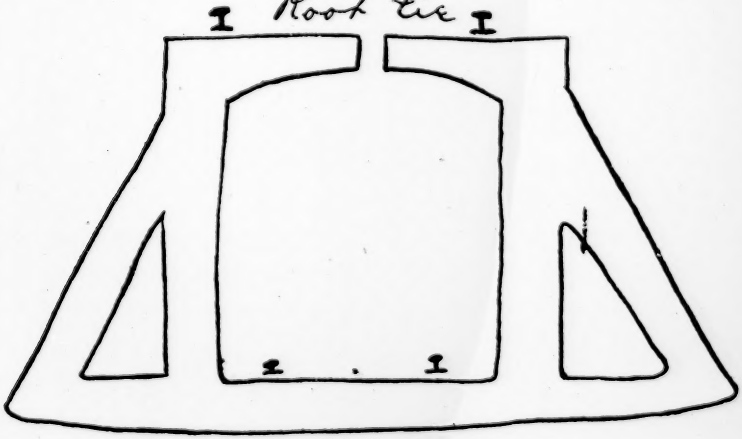
Root tie



Thompson Truss

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Kinds Ave Railroad Co.
United States Circuit Court
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RRC.
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Complainants Exhibit.
"Hunters sketch Clay Street
Hill extension Conduit"

Samuel Rea
U.S. Commissioner
Spl. Examiner

FIG. 1.

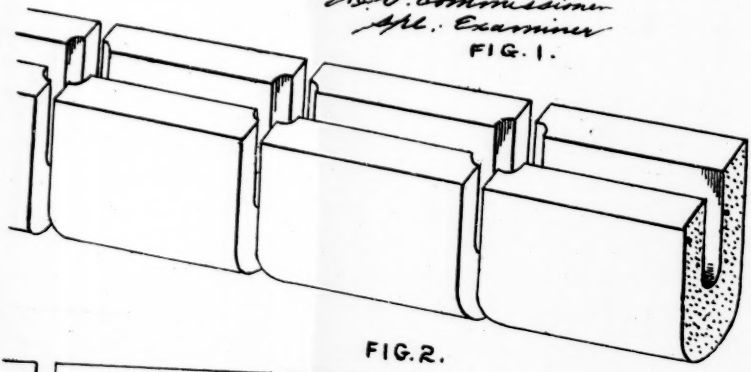


FIG. 2.

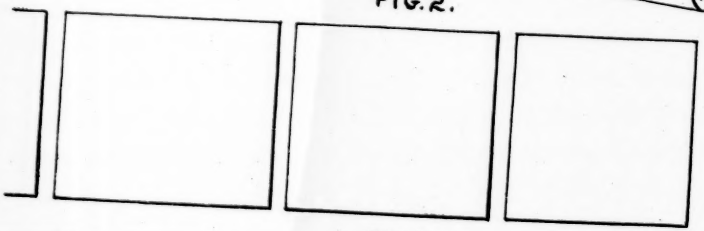


FIG. 3.

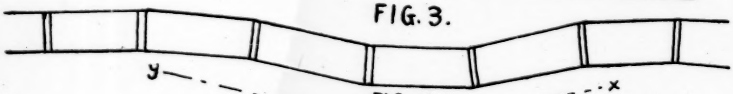
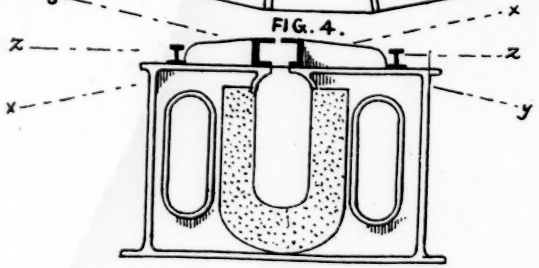


FIG. 4.



the top of the concrete, whereby it is evident that the concrete does not support the pavement. The yokes rest upon the sand and are not supported upon any foundation of concrete or equivalent material. The concrete forming a portion of the tube or tunnel does not extend to the bottom of the yokes, and in no case does it extend laterally beyond the metal forming the yoke where it and the yoke meet. From this it is evident that the concrete sections between the yokes are entirely disconnected and separate, and, as concrete upon settling and hardening shrinks, it follows that there is a loose joint between each yoke and the adjacent sections of the concrete.

Under these circumstances there is nothing to prevent the rails and yokes becoming displaced with reference to the concrete tube or *vice versa;* neither is there anything to prevent one part to sink independent of the other. That I may be clearly understood I have prepared a sketch representing the structure of the Clay-street hill extension conduit and to which I will now refer, and for future identification I will refer to it as "Complainant's Exhibit
137 Hunter's Sketch, Clay Street Hill Extension Conduit."

(Here follows diagram marked p. 136.)

Referring to this sketch, Fig. 1 is a perspective view of the concrete sections employed in the construction of the rope tube or tunnel with the iron-work removed. The sections of concrete are in their natural position with respect to each other, and it will be seen by an examination of that drawing that they are separate and distinct, and one section might be removed or allowed to settle without displacement to the remaining. Fig. 2 is a side elevation of the same sections of concrete tubing showing their clear separation at places where the yokes would come. Fig. 3 shows the possible settling of a cable railway employing this construction (exaggerated). Fig. 4 is a transverse view of the road-bed or tunnel in which the rails are in the plane Z Z. The looseness of the sections of the concrete and yoke permit the settling or displacement so that the rails may be forced into the plane X X or Y Y, the railway structure rotating upon a longitudinal axis. This displacement may be in the rails and yoke independent of the concrete sections, or *vice versa*, or both combined with relation to another section of the railway further along. It is perfectly clear that the yokes which connect the rails are not embedded or surrounded in a concrete foundation, nor is there a tube extending along the railway in which the various parts between the yokes form a monolythic or continuous structure, and which shall act as a bond to the yokes and their rails, as is essential in the construction set out and claimed in the Root patent. I have shown clearly that in the Clay-street hill extension that there is no monolythic structure which united the rail, yokes, and conduit in such a manner that one part thereof cannot possibly settle or become displaced with reference to the others, but, on the contrary, that it consists of rails and yokes with separate independent tube sections of concrete interposed between the yokes, and taking
138 the place of the old wooden tubes formerly used in such

structure; that this structure differs greatly from the invention set out and claimed in the Root patent is apparent when we consider that the fundamental object of the Root patent was to produce a monolythic structure embodying the rails, ties, slot irons, and conduit, and in which no one portion thereof can settle or be otherwise displaced relatively to the others. In the Root patent there is a solid foundation of concrete in which the ties supporting the rails and slot iron are embedded, and when formed into a tube such tube is continuous throughout or practically throughout the entire length of the railway. The Root invention is a monolythic structure of the kind specified, whereas the Clay-street hill extension construction is not.

(Sketch referred to by witness is offered in evidence, and the examiner is requested to mark the same "Complainant's Exhibit Hunter's Sketch, Clay Street Hill Extension Conduit.")

(Counsel for defendant objects to the introduction of this exhibit for the reason that Figs. 3 and 4 thereof show only a condition existing in the mind of the expert.)

Q. 19. Please read over the evidence of Mr. Octavius Knight, expert for respondent, in which he sets out his opinion as to the points of resemblance between the Clay-street hill extension and The Third Avenue Railroad, respondents in this suit, and please state whether you agree with him; and, if not, please point out any reasons you may have for any differences from Mr. Knight.

A. I have read the evidence of Mr. Knight called for in the question, and while agreeing with him in some respects, I differ with him radically in others. For instance, the cast-iron yokes of the Clay-street hill extension, broadly considered, are more or less similar to the yokes or ties used by the defendant and support rails and slot irons in substantially the same manner. So far I agree with him, but on all other matters my opinions do not coincide with those expressed by him, and my reasons for this contrary opinion I will endeavor to make clear.

Adjourned to meet Wednesday, July 11, 1888, at 10 o'clock a. m.

JULY 11, 1888.

Met, pursuant to adjournment, at 10 o'clock a. m.
Present: George J. Harding, Esq., for complainant.

Mr. HUNTER, the witness, resumes:

The structure used by the defendants is one in which the yokes or ties to which the rails or slot irons are connected are surrounded or embedded in a concrete foundation made continuous and constituting the ropeway or conduit so that the parts are so combined as to form a rigid or monolythic structure, no part of which can be moved or displaced relatively to any other part thereof. This feature of construction of defendants' road was made very apparent to me by my various examinations of the road during its construction and after its completion. To explain more clearly and precisely

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Complainant's Exhibit
No. 3.

FIG. 1

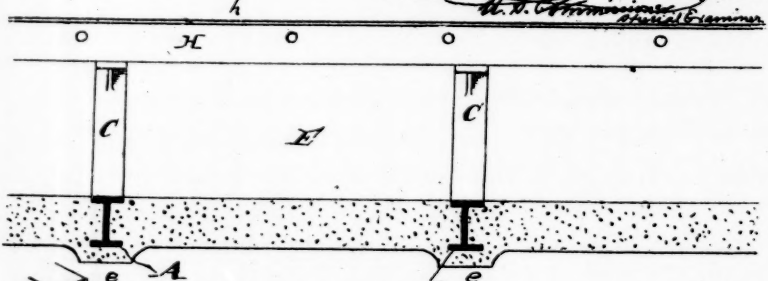



FIG. 2

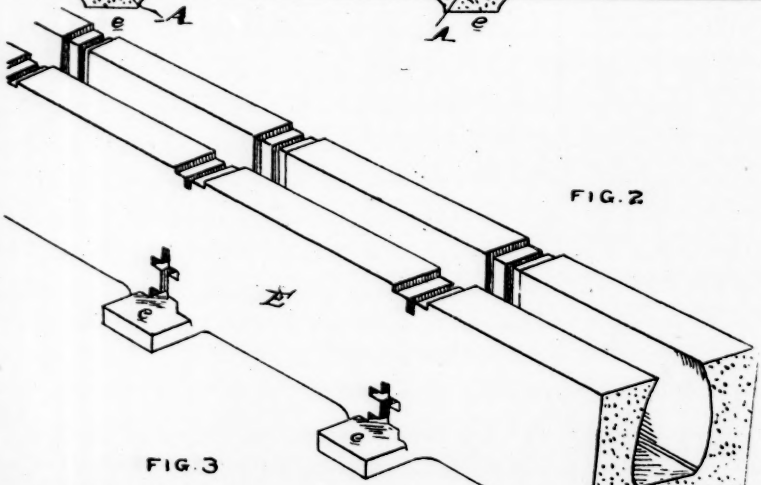
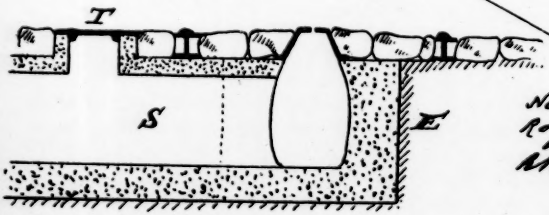



FIG. 3

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the extent to which the defendants' structure is a monolith I have prepared a sketch which to facilitate my explanation I will use in connection with "Complainant's Exhibit No. 2" (which shows the iron-work clearly). Referring to this sketch, which for identification I will call "Complainant's Exhibit No. 3"—

(Here follows diagram marked p. 139.)

We have illustrated three figures, Fig. 1 representing a longitudinal section of the defendants' structure; Fig. 2, a perspective view of the concrete ropeway or conduit with the iron-work removed; and Fig. 3, a cross-section through defendants' structure at one of the man-holes, between two consecutive ties. The letters upon this drawing corresponds with the same parts to which the
141 same letters are applied on "Complainant's Exhibits No. 2."

It will be seen that the concrete E *e* extends continuously along the roadway without any interruption or separation, forming essentially a monolythic structure throughout the length of the railway. The ties or yokes rest upon concrete, and they are surrounded and embedded in concrete to such an extent that there is no possibility of their being displaced and no portion of the tube or conduit can settle or become displaced relatively to other portions. Where the manholes T and the connecting tunnel S with the conduit occur the concrete is brought out laterally under the rails, as shown in Fig. 3, not only forming a support therefore and for the paving above it, but actually connects the concrete of the two parallel railways into a monolythic structure. At the curves the concrete employed in and about the conduit ties or yokes and other iron-work of the railway is largely employed and extends out under the tracks embedding the iron-work and forming a most solid and rigid foundation for the same and constituting a most perfect monolythic structure. The concrete in the defendants' structure is extended up on each side of the ropeway and constitutes a support for the paving between the slot irons and rails. The continuity in the concrete in defendants' structure is clearly shown in Figs. 1 and 2 of "Exhibit 3" and demonstrates beyond a doubt that there are no separate and disconnected sections of tubing and conduit, such as used in the Clay-street hill extension, between the yokes, and as indicated by me in my illustrative sketch marked "Complainant's Exhibit Hunter's Sketch, Clay Street Hill Extension Conduit," consequently the great defects incident to the construction of the Clay-street hill extension do not exist in the defendants' structure. The essential differences between these two constructions may be summed up as follows:

142 First. Defendant's structure is monolythic, and the Clay hill street extension is not.

Second. The tubing or conduit in complainant's structure is continuous, whereas in the Clay-street hill extension the conduit is formed in disconnected sections.

Third. In defendant's structure the ties or yokes rest upon and are embedded and surrounded in concrete, whereas in the Clay-

street hill extension they are not, but are simply interposed so as to form a section of tunnel between two blocks of concrete tubing.

Fourth. In defendant's structure the concrete is extended up on each side of the tube so as to form a support for the paving of the roadway between the slot irons and conduit, whereas in the Clay-street hill extension this is not the case.

These great differences are those which give the defendant's structure the great superiority over the Clay-street hill extension construction by preventing one portion of the track to settle or become displaced with reference to other portions or to the conduit, or *vice versa*, and is indicated in Figs. 3 and 4 of "Complainant's Exhibit Hunter's Sketch Clay Street Hill Extension Conduit."

(Counsel for defendant objects to all testimony relating to "Complainant's Exhibit No. 3" on the ground that it is not proper rebuttal.)

Q. 20. Will you please read over the evidence of Mr. Knight which relates to the comparison of the defendant's structure with the patent in suit, and state whether or not you agree with Mr. Knight and whether you desire to modify any of your evidence which you have heretofore given in this suit, and state your reasons for any answer you may give?

A. I have read the testimony of Mr. Knight referred to and do not agree with him in his statements relative to the defend-
143 ant's structure with reference to the patent in suit. I will consider the claims in the order in which he does. He states with reference to defendant's structure:

"I do not find in 'Complainant's Exhibit No. 2' a concrete foundation in the sense in which this is used in the specification in the patent in suit, where the only use of the term foundation is a foundation for the paving F."

That this is not what is intended by the patent is perfectly clear for many reasons. For instance, in paragraph 2, page 1, the patent describes the iron connection between the rails and slot irons constituting the ties, and goes on to state:

"In combination with the construction I employ a substratum of concrete * * * and unite the whole into a rigid structure, no part of which is liable to be displaced from its relation to the other."

And following this clear description of the function or object of the concrete substratum he also goes on to state "and also provide a support for the roadway." It requires no argument to understand that a substratum of concrete for the ties by which they are united in the manner specified is essentially a foundation in the accepted meaning of that term. The patent simply adds that this substratum or concrete foundation may "also provide a support for the roadway." It will be noted here, too, that the word foundation is not used with respect to the roadway, but instead the word support is employed, and this term "support" for the roadway is in exact accordance with the language of the fourth claim, to wit:

"A support for the roadway," and which claim is the only one relating to such support for the roadway." Mr. Knight erroneously

concludes that the word foundation in the claims is to be ap-
144 plied only to the support of the roadway from the language of the paragraph beginning with line 74 of page 1. This language is as follows:

"This concrete forms a support for the iron-work, the bottom and sides of the tube, and a foundation for the paving F, * * * as is the case where the roadway is supported on sand or other independent foundations."

It is clear that the concrete may support the paving, and to that extent is naturally its foundation, but the concrete itself is placed in the ground expressly for the purpose of forming the tube and supporting and holding the ties and is distinctively the foundation for said ties. The inventor, in the last paragraph of page 1, expressly states that he disclaims the invention of concrete foundations such as would exist if the foundation were to support the pavement alone, and the various claims in the patent, notably 1, 2, and 6, show that the foundations are to be combined with the ties and not for the paving, as the paving is not made elements in these claims. In claims 1 and 2 the concrete foundations for these ties have no limitation as to shape, whereas in claim 6 it is expressly stated that the connections for the rails and slot irons (that is to say, the ties) are supported by "foundations built to form the tube or part thereof." It is not essential to the Root invention that there shall be any pavement whatever, and consequently Mr. Knight is not warranted in interpolating into claims 1 and 2 the "paving." The claims are complete as they stand, and the concrete foundations therein made elements are the foundations for the ties, as it is those elements which it is desired to prevent from being displaced. Mr. Knight, then, first misconstrues the meaning of the claims 1 and 2 so as to make the "foundation" therein formed require a pavement upon it and then proceeds to make the astonishing statement that—

145 "Complainant's Exhibit No. 2 shows the concrete employed only to form the tube and not extending upward so as to constitute the foundation on which the pavement is laid."

An examination of this exhibit will show that the concrete will form a support or foundation for the paving F (the paving stones not being carried down on account of the ties I), but the inconsistency of Mr. Knight's reasoning is apparent when we consider his statements given when he was considering a supposed anticipating patent to Eppelsheimer, No. 193,757, July 1st, 1877. He states:

"But the use of concrete for forming the tube for the cable and foundation for the road-bed being duly disclosed and claimed by Eppelsheimer, it was certainly within the knowledge and reach of the engineer to extend it to a greater or less breadth and height."

Examining this Eppelsheimer patent, which thus, according to Knight, "duly discloses" the "foundation for the road-bed," we will find that the concrete tube is almost identical with that in the defendant's structure, only that it does not extend nearly so high, and to that extent is not even as good a foundation for the roadway as is the defendant's structure; but this is sufficient to show the total

inconsistency of Mr. Knight's position and the absurdity of his attempt, first, to change the foundations of claims 1 and 2 to foundations for the roadway, and, secondly, to attempt by antagonist statements to show that the defendant's pavement or roadway is not supported upon the foundation.

I maintain that the concrete foundation of claims 1 and 2 is that for the ties, and as it exists combined with the other elements of the claims in defendant's structure, such structure would embody the invention of claims 1 and 2 of the Root patent in suit.

146 Claim 3, which is nothing but claim 2 with the concrete foundations limited to being shaped like a tube, is as broad in its scope as I have previously testified it to be. If it is construed broadly, as I have assumed, Mr. Knight states that "it is certainly embodied in Complainant's Exhibit No. 2 or the structure represented thereby," but to escape the charge of infringement he wishes to limit the claim to something which evidently is not clear in his mind, and states that if the claim is to be broadly considered that it would be equally embodied in the Clay-street hill construction. But this is not so, because the Clay-street hill extension I have shown to be anything but a monolythic structure, and that it has not the ties embedded in or surrounded by the concrete, and which is one of the essential features of the Root invention. For these reasons I cannot agree with Mr. Knight in his reasoning, and am of the opinion, as previously testified to, that the invention set out in the third claim of the Root patent in suit is embodied in the defendant's structure.

Recess at 12.30 p. m. until 1.30 p. m.

1.30 P. M.

Met pursuant to adjournment.
Present: As before.

Mr. HUNTER, the witness, resumes:

Mr. Knight refers to the 4th and 5th claims of the patent in suit; but as I understand that these claims are not involved in this suit it is not necessary for me to take up the time of the court in considering what Mr. Knight has said in regard to them.

I now come to the 6th claim, and upon referring to Mr. Knight's depositions I find the following statements:

147 "I do not find in 'Complainant's Exhibit No. 2' (defendant's structure) the combined rails, slot irons, and connections supported by masonry foundation built to form the tube or part thereof."

This is a surprising statement; but, as he does not attempt to show why he does not find the combination of those elements in the defendant's structure, I can only come to the conclusion that he had in his mind some imaginary reasons which he was not prepared to have criticised. The masonry foundation in this claim is unquestionably the "concrete or equivalent material" of line 14, page 1, of the Root patent, and Mr. Knight states:

"If the masonry foundation alluded to in the 6th claim is held to

be an equivalent of concrete for the purposes of this invention, then the claim would be substantially the same as the first."

This is another surprising statement, for if we examine claim 1 we will find that the foundations have no limitation as to shape, whereas in the 6th claim they must be built up to form the tube; and I might also add that the ties in claim 1 are provided with upright supports for the slot irons, whereas the language of claim 6 simply speaks of connections broadly. Another glaring inconsistency shown to exist in Mr. Knight's method of reasoning is found in the language quoted above when taken in connection with his statement in regard to the interpretation which he puts upon claim 1. When considering claim 1 I showed that he endeavored to make out "that the concrete foundation" was the paving support, and yet he now states that it is the same as the "masonry foundation built to form the tube or part thereof" of the 6th claim, which it is self-evident relates to the concrete forming of the tube and in which the ties or "connections" are embedded. I simply cite this an-
148 other instance of Mr. Knight's mode of reasoning. With such pliable views we perhaps can understand his ready denial in the defendant's structure of the matters of the 6th claim. I do not agree with him, because the defendant's structure certainly combines the rails, the slot irons, and connections (the iron-work) supported by a concrete (equivalent to masonry in this claim) foundation built to form a tube or part thereof forming a monolythic structure. The defendants have every elements of the claim combined and operating in the same manner and for the same purpose.

Referring now to claim 7, Mr. Knight chooses to assume that this claim is so broad as to be included by the Clay-street hill extension construction or in prior art, which Root disclaims in his patent. This is simply putting an untenable construction upon the claim, and it would be absurd to suppose that the claim could be construed to cover that which the inventor disclaimed when making his application. This claim comprehends a structure in which iron ribs, of any shape consistent with the invention, extend from rail to rail, and are imbedded and combined with a tube or conduit formed of concrete and open at the top, the entire structure being monolythic, so that no part can be displaced with reference to the others. I have previously shown that such a structure does not exist either in the Clay-street hill extension construction or in the prior art. It is certain that the defendant's structure as illustrated in "Complainant'-Exhibits Nos. 2 and 3" clearly embod*y* the invention set out in the 7th claim when understood to relate to a structure such as I have above explained.

In conclusion, I would say that, after carefully considering all of the matters, patents, and structures relating to the art prior to Root's invention and as considered in my previous testimony, I have no reason whatever for changing or modifying my views expressed in my said previous testimony, and am still of the opinion
149 that the defendant's structure embod*ying* the invention set out in complainant's Root patent and specified in the claims 1, 2, 3, 6, and 7 thereof.

(Sketch referred to by witness offered in evidence, and the examiner is requested to mark the same "Complainant's Exhibit No. 3.")

(Counsel for defendant objects to the introduction of this exhibit on the ground that it is not proper rebuttal.)

Adjourned to meet Friday, July 13, 1888, at 10 o'clock a. m.

WEDNESDAY, *Aug.* 8, 1888.

Met pursuant to notice.

Present: Richard S. Childs, Esq., for complainant; Harry E. Knight, Esq., for respondent.

Cross-examination by Mr. KNIGHT:

Mr. HUNTER, the witness, present.

X Q. 21. As far as the utility of the concrete foundation is concerned, does it make any difference as to the nature of the moving parts of the cable railway—that is, the cars, cable, etc.?

A. The concrete structure forming the subject-matter of the Root invention is designed to form a rigid monolythic construction of road-bed and tunnel, which will allow not only heavy and large cars being used without injury to the road-bed or conduit, but will also enable cables to be driven at a more rapid rate and thereby increase the speed of travel of the car far more than could be accomplished in other forms of road-bed structures. It is also evident that with the firm foundation produced by the construction set out in the Root patent less wear and tear will come upon the cars and cable. The cable might be made heavier without injury to the conduit or tube.

150 X Q. 22. What I mean is, would not the usefulness of the concrete foundation be as apparent in one cable railway as in another?

A. No, sir; because its advantages would be more apparent in cable railways in which large cars would be used and in which the cable was to be driven with a high speed, and its advantages would also be more apparent in cable railways on streets where heavy traffic existed.

X Q. 23. So that the heavier the car or rolling stock used the more desirable it becomes to use concrete foundation?

A. Undoubtedly it is more desirable that the concrete foundation should be used with heavy cars than with light ones.

X Q. 24. That is, the heavier the car is made the greater the pressure on the tracks and consequently the greater tendency to spread them?

A. That might be considered one of the tendencies due to use of heavy cars.

X Q. 25. Do you consider that by increasing the weight of a car that you will increase the tendency to spread the tracks upon which the car travels?

A. I understand the question to refer to the Root construction, and, in answer to the question, will say that in my opinion the in-

creasing of the weight of a car increases the tendency to spread the rails.

X Q. 26. And does it also increase the liability to displace the rails relatively to each other by causing them to set unequally with the ordinary road-bed structures?

A. If the foundation of the ordinary road-bed structures are not properly built the weight of a car will materially tend to produce relative displacement and unequal settling of the rails.

(Answer objected to as not responsive.)

151 X Q. 27. I simply asked you as to the relative effect of two cars of different weights upon the same road-bed.

A. I might supplement my previous answer by stating that the tendency to relative displacement and unequal settling of the rails would be greater with a heavier car than with the light one.

X Q. 28. Then in case of a car traveling over a certain road-bed, would the traction be increased by the addition of a motor upon the car?

A. It would be.

X Q. 29. Would the traction of the said car be increased or diminished if a cable was added for operating the motor, the said cable lying below the tread of the car wheels?

A. That depends on the construction; but at best any increase in the traction would simply be due to the weight of the cable supported by the car and to the lurching of the cable while running.

X Q. 30. Would not the dead pull of the cable, if lifted above its normal line, cause a strain or downward pull upon the car and consequently effect an increased traction between the car wheels and rails?

A. Its effect would be due to the weight of the cable suspended as stated in my previous answer, and to the extent of this weight an increased traction might occur.

X Q. 31. Would the effect be any different, as far as increasing the traction is concerned, between the car having a transmitting gear, shown in Figs. 1, 2, and 3, Holt's English patent No. 1581 of 1876, and the ordinary cable railway gripe—I mean as regards the action of the cable in affecting the traction?

A. The traction in a construction such as used by the defendants, employing a central conduit with a heavy gripe, would be, in my judgment, greater than in the construction shown in Figs 1, 2, and 3 of the English patent referred to, because, in the first place,

152 a heavier cable would be used owing to the slower speed employed relative to the car movement; secondly, because a greater length of this heavier cable would be supported by the gripe; thirdly, that from the construction there would be more freedom of movement for the cable, allowing the objectionable lurching action which cause- the car to pound on the rails; fourthly, because the application of the cable to the gripe is not incline with the tread of the wheels, but is so as to obtain an increased leverage effect and produce uneven running of the car—an inequality of the strains upon the rails.

X Q. 32. The lurching effect which you speak of, would it be a vertical movement of the car or a lateral movement of the car to cause this action?

A. I spoke of the lurching of the cable, which action would produce both vertical and lateral movements of the car, causing unequal strains upon the rails and more or less thumping or pounding of the car wheels upon the rails.

X Q. 33. Have you observed and compared the pounding upon cable railroads as compared with the pounding produced by steam cars upon ordinary railroads?

A. I have not made any particular comparisons, but I am a frequent traveler upon both systems of railroad and have observed the effects referred to in your question.

X Q. 34. Please state the results of your observations.

A. The cause and results of the pounding action in a cable railways I have explained in my previous answers. In the case of steam railway cars the pounding is due, first, to the action of the locomotive itself in rotating its drive wheels, but the most objectionable effect, erroneously called pounding, is that due to the wheels of the cars striking the beginning of each rail. This is more
153 analagous to that experienced in ordinary horse-car railroads with badly laid road-beds. The cause of the pounding action in the case of steam railway cars and that incident to cable railways is so different that it is almost impossible to compare them. The same pounding of the steam railway cars might exist in a cable railway if the tracks were not properly laid without in the least varying the other pounding effects incident to the cable and its connections with the car.

X Q. 35. Then, aside from the so-called pounding movement of the car wheels at the beginning of the rails, which would be practically the same in any road, merely depending upon a construction of road, what would be the comparative effect of the action of a locomotive and the action of the cable?

A. The pounding effect of a locomotive varies with its weight. I have made no experiments on this comparative pounding actions, and therefore am not in the position to give the opinion asked for in the question.

X Q. 36. In a car, say, weighing twenty tons would the pounding effect of a cable be greater than the pounding effect of a locomotive? I mean *with* the pounding effect of the cable necessary to propel such a car be greater upon a road-bed than the pounding effect of a locomotive necessary to run the same car?

A. As stated in my previous answer, I have made no experiments and cannot give the opinion requested in the question.

X Q. 37. Do you not know it to be a fact that the cable railway was introduced upon the New York and Brooklyn bridge for the purpose of dispensing with locomotives, as the pounding of the locomotive upon the bridge structure was considered dangerous?

A. I know it to be a fact that the cable railway was introduced upon the Brooklyn bridge because the locomotive was considered objectionable, but I do not understand that the objection was due

to what may be correctly stated as the pounding of the locomotive.

154 X Q. 38. What did you understand was the objection?

A. I understood the objection to be due to the use of steam generally and the heavy weight due to the locomotive, causing needless objectionable strain and vibrations to the bridge structure, produced mainly by the striking of the wheels upon the joints of the rail, which is far greater where the traction is produced by the wheels on the rails than where the vehicle is pulled by means of a cable, and no self-propelling motor is used.

X Q. 39. Is not the lurch or side movement of a car provided with or drawn by an independent motor greater than where it is drawn by a cable?

A. The side movement may be more steady with a cable than with the employment of a locomotive to pull the car.

X Q. 40. Is it not also so that the pounding movement, irrespective of the road-bed, which we will consider perfectly smooth, greater where an independent motor is used than where the car is drawn by the cable?

A. I cannot say that it is, because the question has illuminated the main cause of the so-called pounding action in self-propelled vehicles, such as locomotives, whereas in the cable road the cable action to induce pounding still exists with its full effect. I am of the opinion that pounding action in cable railways would be much greater than with the self-propelled vehicle under the conditions of the question.

Adjourned to meet Thursday, August 9, 1888, at 10.30 o'clock a. m.

THURSDAY, *August* 9, 1888.

Met pursuant to adjournment at 10.30 o'clock a. m.

Present: George J. Harding, Esq., for complainant; Harry E. Knight, Esq., for respondent.

155 Mr. HUNTER, the witness, resumes:

X Q. 41. Were you present during the construction of the cable railway road-bed now in use by the defendant in the city of New York?

A. The road-bed of the defendants is quite extended. I was present a number of times during the course of its construction. I saw considerable of the road in course of construction, but was not present during the entire construction.

X Q. 42. Were you present at any time when you could observe the laying of the concrete employed in the road-bed?

A. I was.

X Q. 43. How was it laid? Describe the process.

A. A trench was dug along the street, which was widened at intervals to receive the yokes which supported slot irons and rails. These yokes rested upon concrete, and spaces between the yokes was filled in with concrete, extending from yoke to yoke and passing through the openings therein and uniting with the concrete under

the yokes, forming a continuous tube of concrete, as indicated in "Complainant's Exhibit No. 3" and particularly shown in Fig. 2, the upper part of the concrete extending close to the surface of the roadway and acted as a support for the paving stones between the slot irons and rails.

X Q. 44. And you observed these various steps in the construction of this road-bed?

A. I have already stated that I examined the constructing of this road-bed and the putting in place of the concrete.

X Q. 45. What was the condition of the concrete when the yokes were placed in position thereon?

A. I should say that it was more or less hardened or solidified.

156 X Q. 46. In Fig. 2 of "Complainant's Exhibit No. 3" I see openings on the inside of the conduit. What is the meaning of these openings?

A. They are simply grooves in which the iron-work was embedded. Fig. 2 of this exhibit represents the concrete of Fig. 1 with the yokes and slot irons A C H removed, leaving the concrete by itself.

X Q. 47. Then the iron-work of the yokes would stand out flush with the inner surfaces of the concrete part of the conduit?

A. Yes, sir; just in the same way as in the case of the Root patent in suit.

X Q. 48. So that as far as the inner surface of the conduit is concerned the concrete is periodically interrupted by the iron yokes?

A. Yes, sir.

X Q. 49. How is the wrought-iron piece A in "Complainant's Exhibit No. 3" inserted into the concrete after it had become solidified or partly solidified, referring to Fig. 1, "Complainant's Exhibit No. 3"?

A. I have never stated that the part A or any other part of the yoke were inserted into concrete after it had solidified. The yokes, including the part A, are placed in position, and the concrete E is built in around said yokes.

X Q. 50. Was the concrete laid all at one time, I mean as regards any one cross-section, so as to make the structure monolythic, as you term it?

A. The bottom portion was the first laid, and as soon as it was put into shape the mold boards for the sides of the tube were arranged into position and the sides built upon the bottom while in an unhardened condition, and when the conduit so formed hardened the bottom and sides unite into a monolythic structure.

X Q. 51. How long does it take concrete to harden?

A. That question is very indefinite, as concrete goes on
157 hardening a long time after it has apparently solidified. If the question refers to the first solidifying I should say that it would not harden from about thirty-six to forty-five hours.

X Q. 52. So that during these thirty-six to forty-five hours the condition of the concrete is of such a nature that it can be reworked or remolded?

A. I have not stated anything of the kind.

X Q. 53. What is the particular condition of the concrete during this particular time?

A. One of hardening.

X Q. 54. After that time does the hardening stop or what does take place at the latter end of that time?

A. When concrete is first laid in molds it is readily displaced or liable to change its shape, but after the first solidifying or setting it then has strength enough to uphold its own shape if not subjected to excessive strain. From that time on the concrete continues to solidify and harden.

X Q. 55. Then you mean to say that when the concrete is first laid it is sufficiently plastic to yield to an impression?

A. It is.

X Q. 56. And its form or surface can be reworked or modified to a certain extent?

A. I do not understand what the question means by reworked, but while soft, immediately after laying, its surface might be more or less modified.

X Q. 57. And this condition exist during thirty-six to forty-five hours after the laying?

A. I have not so stated. My answer have referred to the concrete immediately after being placed into position and while soft.

X Q. 58. When does the soft condition of the concrete terminate?

(This line of examination is objected to, as the witness is not called as an expert upon concrete.)

158 (The attention of the court is called to the fact that although the witness might not have been called as an expert to testify upon this particular point, yet he has testified in regard to the construction of the so-called monolythic structures, and the present questions of counsel for the defendant *is* directed solely to this point.)

A. I have made no experiments upon this point and therefore cannot answer the question.

X Q. 59. Can you tell how much time must elapse after the concrete is laid before it is of a sufficient hardness to resist mechanical action—that is, an action which would serve to impress the surface without actually breaking it?

A. That is exactly the same question as the previous one, in different language, as I understand it, and I can give no better answer than my previous one.

X Q. 60. You mean you do not know?

A. Certainly I do, because I never made any experiments on that point.

X Q. 61. After the concrete has once solidified can it be broken up and used over?

A. Not without the addition of fresh concrete.

X Q. 62. What proportion of fresh material and what kind of material would have to be used?

A. The proportion would depend upon circumstances and cannot

be told without actual experiment or use. The materials referred to are Portland or Rosedale cement and water.

X Q. 63. After the cement had been once used can its cohesive proctors be restored by remoistening it?

A. Certainly not.

X Q. 64. After a body of concrete has been laid and another body has been added to it after the first body has been laid do the two bodies cohere or adhere together?

A. Under the conditions stated in the question they may.

159 X Q. 65. May cohere or adhere?

A. So far as any limitations in question 64 are concerned, they may both cohere and adhere.

X Q. 66. Irrespective of the condition of the first-laid body of concrete?

A. The question gave no condition of concrete; but if I am to understand that the first-laid body of concrete is to be perfectly hard and solid, then the second-laid body of concrete may be said to simply adhere to that first laid.

X Q. 67. What is the difference in adhesive power between two bodies of concrete and a body of concrete and a body of iron?

A. I presume the question contemplates that one of the bodies of concrete shall be hard before the second body of concrete is built against it. With this understanding of the question I should say that the adhesive property would be greater against the concrete that against the iron, though I have made no experiments on this point and cannot answer definitely.

X Q. 68. Then you cannot state positively?

A. For reasons stated in my previous answer, I cannot.

X Q. 69. Supposing a body of concrete is laid and, after the chemical action upon the surface of said body has ceased, a bar of iron being laid thereon and the parts being united together by concrete, to which will the new body of concrete more firmly adhere, to the old body of concrete or iron?

A. As I understand that question it is substantially the same as cross-question 67, and my answer to cross-question 67 might be considered as an answer to this question also. I might also add that if the surface of the hardened concrete is clean that, in my opinion, the concrete freshly laid will adhere more firmly to the clean concrete than to the iron.

160 X Q. 70. Do you base this opinion on actual knowledge?

A. I have before stated that it was an opinion, and was not based upon actual comparative tests.

X Q. 71. When does the hardening process in concrete cease?

A. The hardening process extends over a long period, but how long that period is I do not know.

X Q. 72. When the concrete is hardening does it expand or contract?

A. There is a tendency to contract.

X Q. 73. I am not asking about tendencies, but about facts.

A. It contracts.

X Q. 74. When does this contracting process cease?

A. Not having made any experiments on this point, I do not know.

X Q. 75. After the chemical action has ceased is there any further tendency to contract?

A. My answer to this question is the same as my previous answer.

At 1 p. m. recess until 2 p. m.

2 P. M.

Met pursuant to adjournment.

Present: As before.

X Q. 76. Does the so-called monolythic structure embrace the iron parts of the structure embedded therein?

A. It does.

X Q. 77. Supposing a crack occurred in the body of the concrete, would this break continue through a contiguous body of concrete laid at a different time?

A. It might and it might not. I cannot tell without having something definite on which to base my opinion.

161 X Q. 78. Supposing the crack was due to the shrinking of one of the bodies of concrete.

A. The question is too indefinite to be answered.

X Q. 79. Supposing the crack occurred in the body of concrete, would the break extend to a contiguous body of concrete, the two bodies of concrete being laid at different times, say two or three days apart?

A. There is no shape given to the concrete nor surrounding of the concrete stated in the question; and without knowing the exact structure I could not answer the question nor give intelligent opinion upon it.

X Q. 80. Supposing the bodies of concrete lie one upon the other, occupying different horizontal planes, and the surrounding material is ordinary earth or clay.

A. Under the conditions assumed in the question I am of the opinion that no crack could occur by the shrinking of one of the blocks of concrete, and therefore the question is purely hypothetical. Supposing, however, that one block was laid and hardened before the other block was laid upon it, a crack (if it were possible) might occur in one block without extending through the other block.

X Q. 81. In the case of the so-called monolythic structure, as set forth in your answer to cross-question 76, would a break be more liable to occur between the concrete and the iron or in the body or masses of concrete?

A. Between the concrete and the iron.

X Q. 82. Even after the concrete had become hardened and the breakage resulted from a concussion or blow?

A. The conditions stated in the last question would not modify, in my opinion, the tendency to break first between the concrete and iron.

X Q. 83. Is it necessary to produce the so-called monolythic
162 structure to make the sides and bottom of the conduit of a single mass so that they will all cohere together?

A. It is necessary that the concrete shall be so formed that the iron-work shall be embedded in it and it with the concrete may form a monolythic structure. The particular language used in the latter part of the question would imply that the concrete, from one end of the railway to the other, must be absolutely continuous so as to be without a single separation due either from method of construction or accidental crack. I consider the monolythic structure of the Root patent in suit would exist if the concrete foundations and tube were continuous (even with accidental crack or dividing line here and there from imperfect connections between two parts of the concrete) and the iron-work were embedded more or less surrounded by the concrete so as to bind the iron-work unmovably in the foundation masses of concrete.

X Q. 84. But aside from the iron part of the construction and the accidental breakings spoken of, is it necessary to make the sides and bottom of the monolythic structure of a single mass so that all of the parts will cohere together?

A. I do not consider that it is necessary.

X Q. 85. Could the monolythic structure be a structure where the sides of the conduit were not formed of a continuous mass, but were connected by another mass laid at a different time?

A. The monolythic structure of the patent in suit comprehends the iron-work and the concrete foundations or tubes in which the iron-work is embedded or partly surrounded. The monolythic feature specially relates to the embedding of the iron-work into the concrete so that neither can be moved without moving the other, and such a monolythic structure might exist if the sides of the concrete were not perfectly continuous throughout the entire length of the railway.

163 X Q. 86. You mean continuous in cross-section from side to side?

A. No; I had reference to the length.

X Q. 87. Well, how about the cross-sections?

A. If the concrete were properly shaped or laid with respect to the iron-work, so as to make it embedded therein, it might be divided longitudinally and still be a monolythic structure.

X Q. 88. In case of a longitudinal division would the yokes and truss serve to bind the parts together sufficiently to make it monolythic?

A. If properly formed they would.

X Q. 89. So that a tendency to depress one side of a car track would be withstood by the other side of the track (more solidly supported) through the medium of the trusses?

A. I have not stated anything about inequalities in the support of the track, and do not understand the question.

X Q. 90. In case of the longitudinal division such as spoken of in cross-question 88, would the trusses or yokes serve to keep the two sides of the conduit in a constant relative position?

A. When the longitudinal line of division occurred, the concrete would be united by the yoke, and, of course, any strains transmitted from one rail to the other must pass through the concrete

and truss or yoke. The concrete would support the truss against displacement, and would thereby indirectly support the rails against displacement, and all of the concrete might be considered as a general foundation for the iron-work of the railway structure.

X Q. 91. As the concrete hardens does the tendency to crack or break by concussion increase or decrease?

A. I have no definite knowledge on that point.

X Q. 92. Supposing the concrete would crack or separate just beneath the yoke in complainant's patent, and the structure would be held together through the medium of the trusses or yokes, would this be a monolythic structure?

164

A. The structure would not necessarily be held together only by the yokes, as the concrete would be firmly embedded in the earth and would support the yokes firmly in position, and, since the iron-work would be embedded in the concrete, such a structure would be monolythic.

Adjourned to meet Friday, August 10, 1888, at 10 o'clock a. m.

FRIDAY, *August* 10, 1888.

Met, pursuant to adjournment, at 10 o'clock a. m.

Present: As before.

Mr. HUNTER, the witness, resumes:

X Q. 93. You have testified in regard to various cable railway constructions, showing conduits of different sizes, said conduits being exhibited in the various exhibits of the defendant. Now, do you place any limitation upon the size of the conduit shown, described, and claimed in complainant's patent?

A. I place no particular limitation upon the size of the conduit in the Root patent, but I do not consider that a construction in which we find a groove in the rail just about large enough to conveniently contain the cable that we would find the Root invention, this construction being one shown in defendant's exhibits. I would refer to "Defendant's Exhibit Holt English Patent of 1876."

X Q. 94. Does not Fig. 1 of that patent show the conduit provided with carrying pulleys and a cable with a gripping device capable of being lowered into said conduit for connecting with the said cable?

A. That patent distinctly states that it consists—

165

"In a new form of rail. * * * The depth of the groove in which the flanges of the wheel run is sufficient to contain a light endless rope running on bearings and guide-rollers at intervals."

If a grooved rail is a conduit in the sense in which that term is commonly used in cable railways as now constructed, the patent may be said to contain a conduit, but such conduit would be an integral metal structure with the rail. In regard to that portion of the question referring to the gripe extending down into the conduit, I will say that there is no gripping apparatus shown in this patent. A large wheel, C, is caused to revolve by means of a rapidly travel-

ing cable pressed against it to create a friction sufficient to induce a rotation, and said rotating wheel, by gearing, imparts rotation to the axle of the car.

X Q. 95. Is not the tube or conduit shown in the right-hand side of Fig. 3 of Holt's English patent formed of different sections of iron?

A. I presume the question has reference to different sections when taking a cross-section of the conduit. With this understanding, I will state (after careful examination of the drawing under a microscope) that the conduit is made in one integral casting with the rail and with plugs screwed in the side as a support for the bearings.

X Q. 96. Is not the device for clutching the cable capable of being lowered into the conduit?

A. The device shown in the patent is not adapted to clutch or grasp the cable in the sense in which those terms are used with ordinary gripping apparatus, but the lower wheel and its supporting arm for raising the cable up in contact with the wheel C above the conduit is supported in the slot of the conduit and projects partly above and partly below, as is clearly shown in Figs. 1 and 3 of the drawing.

166 X Q. 97. Apart from the claims of the Root patent in suit, do you find the word "foundation" employed in any other sense than as the foundation for the roadway and track rails?

A. In my direct evidence, in answer to question 20, I have explained in detail my reasons for considering that the word foundation in the claims sued upon related to the foundation for the ties. While there is much matter in the specification implying that the concrete is a foundation for the ties or yokes, I do not find the specific use of the term foundation used in this connection.

(All that part of the answer which relates to the "claims sued upon" objected to as irresponsive. The balance of the answer, with the exception of the sentence commencing "I do not find" and ending with "connection," objected to as uncalled for.)

R. M. HUNTER.

Sworn and subscribed to before me this 10th day of August, A. D. 1888.

____ ____,

*U. S. Commissioner, Special Examiner.*

167 COMPLAINANT'S EXHIBIT No. 1.

United States Circuit Court, Southern District of New York.

HENRY ROOT
*vs.*
THIRD AVE. RAILROAD CO. } In Equity. No. 3866.

R. S. C., JR.,
*Notary Public.*

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office of the letters patent granted Henry Root August 1, 1882, No. 262,126, for improvement in the construction of cable railways.

In testimony whereof I, M. V. Montgomery, Commissioner of Patents, have caused the seal of the Patent Office to be affixed this second day of December, in the year of our Lord one thousand eight hundred and eighty-six, and of the Independence of the United States the one hundred and eleventh.

[SEAL.] M. V. MONTGOMERY,
*Commissioner.*

168 No. 262,126.

THE UNITED STATES OF AMERICA:

To all to whom these presents shall come:

Whereas Henry Root, of San Francisco, California, has presented to the Commissioner of Patents a petition praying for the grant of letters patent for an alleged new and useful improvement in the construction of cable railways, a description of which is contained in the specification, of which a copy is hereunto annexed and made a part hereof, and has complied with the various requirements of law in such case made and provided; and

Whereas, upon due examination made, the said claimant is adjudged to be justly entitled to a patent under the law:

Now, therefore, these letters patent are to grant unto the said Henry Root, his heirs or assigns, for the term of seventeen years from the first day of August, one thousand eight hundred and eighty-two, the exclusive right to make, use, and vend the said invention throughout the United States and territories thereof.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the city of Washington, this first day of August, in the year of our Lord one thousand eight

hundred and eighty-two, and of the Independence of the United States of America the one hundred and seventh.

[SEAL.] M. S. JOSLYN,
*Acting Secretary of the Interior.*

Countersigned:
E. M. MARBLE,
*Commissioner of Patents.*

169 UNITED STATES PATENT OFFICE.

HENRY ROOT, of San Francisco, California.

*Construction of Cable Railways.*

Specification forming part of Letters Patent No. 262,126, dated August 1, 1882. Application filed September 3, 1881. (No model.)

To all whom it may concern:

Be it known that I, Henry Root, of the city and county of San Francisco, State of California, have invented an improvement in the construction of cable railways, and I do hereby declare the following to be a full, clear, and exact description thereof:

My invention relates to cable railways, and it consists in the employment of a connecting tie for the rails and supports for the slot irons by which both are rigidly supported from the tie and united to each other. In combination with this construction I employ a substratum of concrete or equivalent material, which will set or solidify and unite the whole into a continuous rigid structure, no part of which is liable to be displaced from its relation to the other, and also provide a support for the roadway.

171 Previous to my invention all cable railways had been constructed of iron ribs of the form of the tube, set at suitable intervals, to which the slot iron or timber, as the case may be, was bolted and the spaces between these ribs filled with wood to form a continuous tube. Outside and independent of this tube the rails were laid, supported on short ties or other foundations, and were connected horizontally with the iron ribs by short bolts or rods, but were liable to settle by the undermining of their foundation without regard to the tube or the other rail of the track. This would frequently occur by the renewal of the paving outside of the track, the introduction of house connections with the main sewer, or other disturbances of the street. This settling would cause great inconvenience, as the gripping apparatus, which is carried by the rails through the medium of the car or dummy, must travel in a fixed position in the tube, thus making a frequent adjustment of the rails to the tube necessary. The space between the rails and sides of the tube was filled with sand, which could not be securely confined, as the joints in the tube were liable to open by settling, so as to require a frequent relaying of the paving or planking and making the whole insecure and expensive to maintain. In my invention the whole forms a single rigid structure.

(No Model.)

# H. ROOT.

## CONSTRUCTION OF CABLE RAILWAYS.

No. 262,126. Patented Aug. 1, 1882.

No. 39. Root v. R.R.Co. } p. 170

Fig. 2

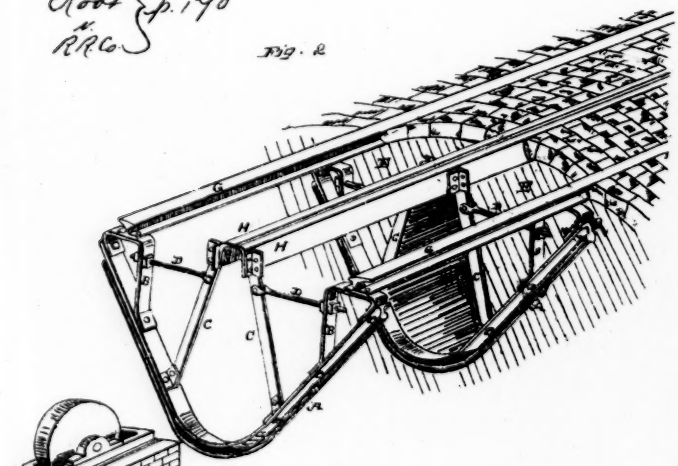
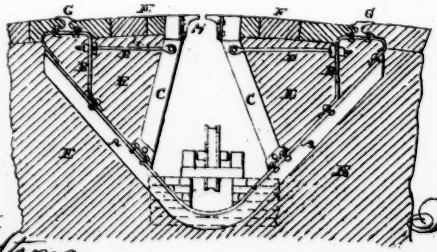



Fig. 1




Witnesses
Geo. H. Strong.

Inventor
Henry Root

Referring to the accompanying drawings for a more complete explanation of my invention—

(Here follows diagram marked p. 170.)

Figure 1 is a cross-section and Fig. 2 is a perspective view.

A is the main tie, bent so as to embrace the tube, and it has fastened to the ends suitably formed plates or chairs B, to which the rails G are fastened or, if stringers are used, they may be fastened directly to the ties. The ties may be of various shapes, but in this case I have used old T-rail turned bottom up, with but one curve or bend, as this requires but one heat and is thus cheaper.

172 C are upright supports for the slot irons, having one end secured to the tie at points each side of the bend, sufficiently separated to form the necessary width for the tube.

D are tie-rods connecting said supports with the main ties or frames through the chairs, rails, or stringers, as the case may be. The rods D may be fixed or may be screw-bolts having two nuts at one end for the adjustment of the slot irons to or from each other during construction or other equivalent means may be employed.

E is the concrete, in which the ties or frames are embedded at suitable distances to support the rails and slot irons, which form the top of the tube. This concrete forms a support for the iron-work, the bottom and sides of the tube, and a foundation for the paving F, which fills the space between the rails and slot iron, thus forming an even and durable roadway, which cannot settle below the level of the rails or slot irons or cause a side pressure on the tube, as is the case where the roadway is supported on sand or other independent foundation. As nearly all the weight of the traffic is on the rails, the tendency of the rails to go down is resisted by a deep girder, of which the bent tie forms the top and this continuous mass of concrete forms the bottom.

I am aware that concrete as a material for foundations, underground sewers, and conduits has long been well known, and that concrete, brick-work, or ironstone pipe might be used to form the tube between the iron ribs of the well-known construction without any particular invention, as these materials are as well known as wood, but it would be still subjected to all the danger of unequal settlement and the short tie and stringer of wood require frequent renewal and adjustment to the level of the tube.

173 It will be seen that a distinguishing feature of my invention is the connecting of the rails in the same structure as the slot irons and the tube so that all the parts are maintained in their relative position, and whatever may occur to alter the place of one will have no effect unless the change is sufficient to affect the whole structure.

Having thus described my invention, what I claim as new and desire to secure by letters patent is—

1. In a cable railway, the tie connecting the rails and the upright supports for the slot irons in combination with a concrete foundation, substantially as and for the purpose herein described.

2. In a cable railway, the track-supporting ties A in combination with the concrete foundation, substantially as and for the purpose herein described.

3. The combination of the rails G, ties A, and the tube formed of concrete or equivalent material, substantially as herein described.

4. In a cable railway, the rails and slot irons supported and united by the ties A in combination with a continuous surrounding mass of concrete or equivalent material forming a bond and a support for the roadway, substantially as and for the purpose herein described.

5. In an underground cable railway, a structure consisting of the rails, the slot irons, and connecting ties, consisting of bent bars embracing and supporting the tube, substantially as set forth.

6. The combined rails, slot irons, and connections supported by a masonry foundation built to form the tube or part thereof, substantially as set forth.

174 7. In a tramway track for wire-rope railroads, a tube to receive the rope or cable made of concrete or equivalent material open at the top and combined with iron ribs, substantially as set forth.

In witness whereof I have hereunto set my hand.

HENRY ROOT.

Witnesses:
S. H. NOURSE.
FRANK A. BROOKS.

175 United States Circuit Court, Southern District of New York.

HENRY ROOT
*vs.*
THIRD AVENUE RAILROAD COMPANY. } In Equity. No. 3866.

Please take notice that testimony for defendant in the above-entitled cause will be taken before a competent officer at the office of George Pardy, Esq., No. 402 Montgomery street, San Francisco, California, on Tuesday, September 27, 1887, at 11 o'clock in the forenoon. Names of the witnesses: William A. Milliken, Alvah C. Austin, Wallace W. Hanscom, and George Pardy, all of San Francisco, and others.

The examination will continue from day to day until completed. You are invited to attend and cross-examine.

Dated New York, September 9, 1887.

Respectfully,
HOADLY, LAUTERBACH & JOHNSON,
*Solicitors for Defendant.*

To George Harding, Esq., solicitor and counsel for complainant.

Service accepted this 13th day of September, 1887.
GEORGE HARDING.

176 United States Circuit-Court, Southern District of New York.

HENRY ROOT
*vs.*
THIRD AVENUE RAILROAD COMPANY. } In Equity. No. 3866.

STATE OF CALIFORNIA,
*City and County of San Francisco,* } *ss:*

Be it remembered that on this twenty-seventh day of September, A. D. one thousand eight hundred and eighty-seven, before me, Holland Smith, a notary public of the State of California in and for the city and county of San Francisco, duly commissioned and sworn, at the office of George Pardy, Esq., No. 402 Montgomery street, San Francisco, California, personally appeared George Pardy, W. W. Hanscom, Henry Root, and W. H. Milliken, witnesses produced on behalf of the defendant in the above-entitled suit. J. H. Dickinson, Esq., appeared as counsel for defendant, counsel for complainant not appearing.

GEORGE PARDY, having been by me first cautioned and sworn to testify the whole truth before the commencement of his testimony, was carefully examined, and his testimony reduced to writing by me, and he deposed and said as follows—that is to say:

Examination-in-chief of GEO. PARDY.

(Question by J. H. DICKINSON, Esq.:)

1. Please state your name, age, residence, and occupation.

177 Ans. My name is George Pardy; my age, over twenty-one years; residence, the city and county of San Francisco, and by occupation I am a mechanical engineer and patent solicitor.

At this point the further taking of testimony was adjourned to Wednesday, September 28, 1887, at 11 o'clock a. m., at the same place.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., WEDNESDAY, *Sept.* 28, 1887.

Met pursuant to adjournment.

Counsel agreeing, adjourned to Thursday, Sept. 29, 1887, at 11 o'clock a. m., same place.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., THURSDAY, *Sept.* 29, 1887.

Met pursuant to adjournment.

Present: Henry Root, the complainant, and George Pardy, witness.

The following telegram, viz:

"Dated WASHIN., D. C., 27.

"To George Pardy, 402 Montg'y St., S. F.:

"Postpone testimony till October twenty-fifth.

"OCTAVIUS KNIGHT."

178 was then handed the notary taking this deposition by Mr. Pardy, who requested the notary to attach the same thereto.

Mr. Pardy then stated that he was about to leave the city for a few days on business.

Mr. Henry Root stated he was not prepared to consent to an adjournment.

The notary then stated that, under the circumstances, he would adjourn the proceedings in this case until Friday, September 30, 1887, at the hour of 11 o'clock a. m., same place.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., FRIDAY, *Sept.* 30, 1887.

Met pursuant to adjournment.

Mr. Pardy, the witness, having been called away from the city on important business, adjournment was taken until Saturday, October 1st, 1887, at the same place and hour.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., SATURDAY, *October 1st*, 1887.

Met pursuant to adjournment.

Mr. Pardy being still absent from the city, adjourned to Monday, October 3d, 1887, at the same hour and place.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., MONDAY, *October 3d*, 1887.

Met pursuant to adjournment.

The witness not appearing, adjourned to Tuesday, October 4th, 1887, same hour and place.

179 Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., TUESDAY, *October 4th*, 1887.

Met pursuant to adjournment.

The witness not appearing, adjourned to Wednesday, October 5th, 1887, at same hour and place.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., WEDNESDAY, *October 5th*, 1887.

Met pursuant to adjournment.

Mr. Knight not having arrived, at request of Mr. Pardy, adjourned to Thursday, October 6th, 1887, at same hour and place.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., THURSDAY, *October 6th*, 1887.

Met pursuant to adjournment.

Mr. Knight not having arrived, adjourned to Friday, October 7th, 1887, same hour and place.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., FRIDAY, *October 7th*, 1887.

Met pursuant to adjournment.

Mr. Knight not having arrived, adjourned to Saturday, October 8th, 1887, at same hour and place.

180 Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., SATURDAY, *October 8th*, 1887.

Met pursuant to adjournment.

Mr. Knight not having arrived, adjourned to Monday, October 10th, 1887, at same hour and place.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., MONDAY, *October 10th*, 1887.

At same hour and place met pursuant to adjournment.

Mr. Knight not having arrived, adjourned to Tuesday, October 11th, 1887, same place and hour.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., TUESDAY, *October 11th*, 1887.

Met pursuant to adjournment.

Mr. Knight not having arrived, adjourned to Wednesday, October 12th, 1887, same hour and place.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., WEDNESDAY, *October 12th*, 1887.

Met pursuant to adjournment.

181 Mr. Knight not having arrived, adjourned to Thursday, October 13th, 1887, same hour and place.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., THURSDAY, *October 13th*, 1887.

Met pursuant to adjournment.

Adjourned to Friday, October 14th, 1887, at same hour and place.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., FRIDAY, *October 14th*, 1887.

Met pursuant to adjournment.

Present: George Pardy, who stated that Mr. Knight had not yet arrived.

Adjourned to Saturday, October 15th, 1887, at same place and hour.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., SATURDAY, *October* 15*th*, 1887.

Met pursuant to adjournment.

Mr. Knight not having arrived, adjourned to Monday, October 17th, 1887, same hour and place.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., MONDAY, *October* 17*th*, 1887.

Met pursuant to adjournment.

Mr. Knight not having arrived, adjourned to Tuesday, October 18th, 1887, same hour and place.

182 Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., TUESDAY, *October* 18*th*, 1887.

Met pursuant to adjournment.

Mr. Knight having not arrived, adjourned to Wednesday, October 19th, 1887, same hour and place.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., WEDNESDAY, *October* 19*th*, 1887.

Met pursuant to adjournment.

Mr. Knight not having arrived, adjourned to Thursday, October 20th, 1887, at same place and hour.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., THURSDAY, *October* 20*th*, 1887.

Met pursuant to adjournment.

Mr. Knight not having arrived, adjourned to Friday, October 21st, 1887, same place and hour.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., FRIDAY, *October* 21*st*, 1887.

Met pursuant to adjournment.

Mr. Knight not having arrived, adjourned to Saturday, October 22d, 1887, same hour and place.

183 Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., SATURDAY, *October* 22*d*, 1887.

Met pursuant to adjournment.

Mr. Knight being still absent, adjourned to Monday, October 24th, 1887, same hour and place.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., MONDAY, *October* 14*th*, 1887.

Met pursuant to adjournment.

Mr. Knight being still absent, adjourned to Tuesday, October 25th, 1887, same hour and place.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., TUESDAY, *October 25th*, 1887.

Met pursuant to adjournment.
Adjourned to Wednesday, October 31st, at same place and hour.

Office of Geo. Pardy, 402 Montgomery street.

SAN FRANCISCO, WEDNESDAY, *October* 20, 1887.

Met pursuant to adjournment.
184 Mr. Pardy exhibited telegram received from Mr. Knight, dated Denver, Oct. ——, —, requesting the matter of taking depositions postponed until Tuesday next.

Adjourned to Thursday, Oct. 27, 1887, same place and hour.

Office of Geo. Pardy, 402 Montgomery street.

SAN FRANCISCO, THURSDAY, *October* 27, 1887.

Met pursuant to adjournment, as per request.
Adjourned to Friday, October 28, 1887, same hour and place.

Office of Geo. Pardy, 402 Montgomery street.

SAN FRANCISCO, FRIDAY, *Oct.* 28, 1887.

Met pursuant to adjournment, as per request.
Adjourned to Saturday, October 29, 1887, same hour and place.

Office of Geo. Pardy, 402 Montgomery street.

SAN FRANCISCO, CAL., SATURDAY, *October* 29, 1887.

Met pursuant to adjournment, as per request.
Adjourned to Monday, October 31, 1887, same hour and place.

Office of Geo. Pardy, 402 Montgomery street.

SAN FRANCISCO, MONDAY, *Oct.* 31, 1887.

Met pursuant to adjournment, as per request.
Adjourned to Tuesday, November 1st, 1887, same hour and place.

185 Office of Geo. Pardy, 402 Montgomery street.

SAN FRANCISCO, CAL., TUESDAY, *November 1st, A. D.* 1887.

Met pursuant to adjournment.
Mr. Knight not having arrived, adjourned to Wednesday, November 2d, 1887, at same hour and place.

Office of Geo. Pardy, 402 Montgomery street.

SAN FRANCISCO, CAL., WEDNESDAY, *November 2d*, 1887.

Met pursuant to adjournment.
Mr. Knight not having arrived at the hour set, adjourned to Thursday, Nov. 3d, 1887, at same hour and place.

Office of Geo. Pardy, 402 Montgomery street.

SAN FRANCISCO, CAL., THURSDAY, *November* 3*d*, 1887.

Met pursuant to adjournment.

Present: Henry Root, complainant; Mr. Knight, for respondent, and the witness, Geo. Pardy.

By agreement adjourned to Friday, Nov. 4, 1887, at same hour and place.

Office of Geo. Pardy, 402 Montgomery street.

SAN FRANCISCO, CAL., FRIDAY, *November* 4, 1888.

Met pursuant to adjournment.

Present: Henry Root, complainant; Mr. Knight, for respondent, and the witness, Geo. Pardy.

186 Mr. Root stated that his attorney was sick and unable to appear to-day, when it was, on motion, agreed to adjourn to Saturday, Nov. 15, at 11 o'clock, same place.

Office of Geo. Pardy, No. 402 Montgomery St.

SAN FRANCISCO, CAL., SATURDAY, *November* 5, 1887.

Met pursuant to adjournment.

Owing to the illness of Mr. Booth, adjourned to 2 p. m. Monday, November 7, 1887, at same place.

Office of Geo. Pardy, No. 402 Montgomery St.

SAN FRANCISCO, CAL., MONDAY, *Nov.* 7, 1887.

Met pursuant to adjournment.

By agreement adjourned to Tuesday, November 8, 1887, at 10 o'clock a. m., same place.

Office of Geo. Pardy, No. 402 Montgomery St.

SAN FRANCISCO, CAL., TUESDAY, *Nov.* 8, 1887.

Met pursuant to adjournment.

Present: Henry Root and W. F. Booth, for complainant; J. H. Dickinson, for defendant.

Mr. Knight and Geo. Pardy, the witness, whose examination was continued as follows:

2 Ques. Have you had any connection with the construc-
187 tion of cable railway in this city? If yea, please state the circumstances, giving dates, so far as may be in your power?

Ans. I have had considerable to do with cable railways since 1874 or '5, at which time I was engaged for the Sutter Street Railroad Co. to get up plan for a portion of their cable-railway plant. Afterwards assisted in the superintendence and erection of the same, and since that time I have been almost constantly working in my capacity of patent solicitor in cable-railway matters.

3 Ques. Please state in detail any facts within your knowledge in connection with the construction of the Clay-street extension cable

road in San Francisco, giving details as to the construction of the road-bed, track, and tunnel or cable conduit, stating the date at which the construction was made, so far as you may be able.

Ans. In the spring or summer of 1877 I had my office on Fremont street, over the Empire foundry. Upon the sidewalk I saw a large number of castings piled one upon another which attracted my attention, and I inquired for what purpose they were to be employed. I was informed by one of the proprietors of the foundry that they were for the Clay-street cable railway, to be used as yokes for the subway or tunnel.

Counsel for complainant objects to the statement of witness as to what he was informed by others on this occasion.

WITNESS, resuming: Subsequently I was passing by the Clay-street railway, and I recognized these same castings distributed along the road and some of them placed in the ground, in the process of forming the subway, together with a quantity of broken-up rock and cement and mixed concrete, partly set in the ground, and a portion contiguous to the track, clearly indicating to me that the subway was being formed out of these cast-iron yokes and concrete combined.

188 4 Ques. Can you make or produce a drawing from memory representing substantially the construction of the yokes or castings referred to in your last answer?

Ans. I can.

Counsel for defendant requests the witness to produce such a drawing showing the construction of the yoke, and here gives notice that he will on the production of such drawing offer it in evidence in this case as a part of the present deposition.

5 Ques. Where is the Clay-street extension cable road referred to in your previous answers located, and how is it related to the California-street cable road?

Ans. The Clay-street extension runs from Leavenworth street to Van Ness avenue, a distance of five blocks. The Clay street is a straight street without curves where the railroad is situated, and runs parallel with California street, the two streets being two blocks apart.

6 Ques. Please state any facts which enable you to fix the date above given as to the construction of the extension of the Clay-street cable road.

Ans. I know the time from the fact that I was located on Fremont street (my office) at that time, and that I moved away from that locality shortly afterwards.

7 Ques. Please state if you know who designed the construction of the Clay-street extension cable road to which you have referred.

Ans. I know that Mr. S. H. Wheeler was engaged in the designing of that road as engineer—Samuel H. Wheeler.

8 Ques. State as nearly as you can when the Clay-street extension cable road to which you have referred was open to business.

Ans. I cannot give that accurately; it was running early
189 in 1878, but had been running some time before; I had occasion to see it.

9 Ques. Has the cable road been in regular public use ever since that time, ordinary delays excepted?

Ans. Excepting the time I have been away from the city, I can answer yes. As to the time I have been away, I do not know.

10 Ques. Is it or is it not one of the cable railways which are in regular and successful use in this city?

Ans. Yes.

11 Ques. Now please state fully and in detail any knowledge you may have as to the construction of the California-street cable road in this city, giving dates as far as your memory permits.

Ans. I saw the California-street railway in process of construction in 1877, about the same time the extension was going on on Clay street. The subway of the California-street road is formed of a mass of concrete and wrought-iron braced ribs or yokes.

12 Ques. Can you make or produce a drawing representing the form and construction of the road-bed and yokes of the California-street road? That will elucidate your last answer.

Ans. Yes.

Counsel for the defendant requests the witness to produce such a drawing before the close this deposition, and also such a drawing as will show the construction of the Clay-street extension road, and gives notice that he will attach said drawings to this deposition.

13 Ques. From whom and at what time and under what circumstances did you first hear the proposition to construct a cable railway with a tube to receive the cable, made of concrete or equivalent material, open at the top and combined with iron ribs?

190 Ans. That form of construction was described to me in 1876 by Wm. Eppelsheimer as of his invention under the following circumstances: I met Mr. Eppelsheimer in that year on Montgomery street, with a roll of drawings in his hand. I had not seen him for some time; he had just returned from a journey; I think he had returned from Germany. He consulted with me in regard to taking out a patent for a new style of tube. He described it to me in a general way, not in detail. The main feature of this new tube consisted of a combination of iron ribs or yokes and a mass of concrete, which should form the tube and make a firm foundation for the structure. I remember arguing with him as to the probability of obtaining a valid patent for such a construction in a broad sense. He did not open the roll of drawings, as it was in the street that our conversation took place, but I distinctly remember his mentioning the fact of his having consulted with some prominent railroad people in this city with a view of getting them to adopt his plan, but I cannot say who those people were; he either did not mention them or, if so, I have forgotten.

14 Ques. Please explain the expression, "a new style of tube," in your last answer, referring to what Mr. Eppelsheimer was talking about at the time mentioned.

Ans. Previous to this time there were two tubes in use for the purpose of cable railways, both made of wood to form the tube, which soon rotted out and was generally unserviceable. This concrete was intended to take the place of the wooden structure and generally to make the tube more secure and permanent. The words "tube," "subway," "tunnel," and "cableway" are synonymous terms.

15 Ques. Did you clearly understand from Mr. Eppelsheimer, at the time referred to, the purpose of the tube, which, as you say, he described as "consisting of a combination of iron ribs or yokes and a mass of concrete, which should form the tube and make a firm foundation for the structure"? If so, please state what
191 you learned or understood from Mr. Eppelsheimer at that time in this connection.

Ans. I clearly understood Mr. Eppelsheimer as to the purpose for which his tube was to be used. I had had previously some conversation in regard to cable railway matters, and our conversation, whenever we met, was almost entirely confined to this subject. I can say positively that his tube was for cable railway purposes.

At this point recess was taken until three o'clock p. m.

16 Ques. You referred, Mr. Pardy, in one of your previous answers to a consultation of Mr. Wm. Eppelsheimer with you in regard to his desire to secure a patent for a tube or cableway for cable railways made of concrete combined with iron ribs; please state if you know whether the said Wm. Eppelsheimer took any further steps towards securing such a patent.

Ans. I know he did because I afterwards saw the patent, and that patent included a claim for that construction. This, however, is a matter of record and can be referred to.

17 Ques. Can you give the number and date of the Eppelsheimer patent, either from recollection or reference to any record within your reach?

Ans. I cannot from recollection, but I have a record. The patent was issued to Eppelsheimer July 31, 1877; the application was filed January 18, 1877, and the patent was numbered 193,757.

18 Ques. Have you any knowledge of interference proceedings subsequently had in the Patent Office with this Eppelsheimer patent? If so, please state concisely what you know about such interference.

Ans. I know that Mr. Eppelsheimer, when he was in Europe, some time in 1882 or the early part of 1883, instructed me, as his attorney, to endeavor to reopen an interference case in the Patent
192 Office between himself and Mr. Henry Root upon the subject-matter of this patent, of which interference case he had been up to that time entirely without knowledge. I thereupon made an attempt to reopen the case, but did not succeed, upon the general grounds that the entire matter had passed beyond the jurisdiction of the Patent Office.

Counsel for complainant objects to the foregoing answer as being irrelevant.

19 Ques. On what ground did Wm. Eppelsheimer seek to reopen the interference, as stated in your last answer?

Objected to by counsel for complainant as being immaterial, incompetent, and irrelevant.

Ans. Upon several grounds, the main one being want of notice.

20 Ques. What was the final result of the interference proceedings?

Ans. The final result was we did nothing more. Root had the patent before we knew of the case, and the final result was we abandoned it in the Patent Office.

21 Ques. Can you give the number and date of the patent which was issued to Mr. Root as the result of these interference proceedings, as intimated in your last answer?

Ans. The patent was issued to Mr. Root August 1, 1882, and was numbered 262,126.

Counsel for defendant here gives notice that he will offer in evidence, to be read at the hearing of this case, a copy of the record of the interference proceedings to which the witness has referred, for the purpose of showing the relations of the two patents
193 granted to Wm. Eppelsheimer and H'y Root respectively, as explained by the witness.

22 Ques. Can you now produce a drawing showing your recollection of the construction of the cast-iron yokes for the Clay-street extension road, as referred to in your answer to question No. 3?

Ans. Yes; I now present this sketch to the notary taking this deposition, and for identification request him to mark the same "Defendant's Exhibit A."

23 Ques. Please produce, if you can, a drawing representing the present construction of the Clay-street extension cable railway, marking the iron yoke with the letter "A" and the concrete to which you have referred with the letter "E."

Ans. Yes; I now present this sketch to the notary taking this deposition and request him for identification to mark the same Defendant's Exhibit B, the same being the drawing called for, and I have marked the same as requested.

24 Ques. Now please produce, if you can, a drawing representing in cross-section the construction of the California-street cable railway referred to in your deposition and mark the bent iron tie connecting the track rails with the letter "A," the vertical support for the slot rails "C," and the concrete E.

Ans. Yes; I now present this sketch to the notary taking this deposition and request him for identification to mark the same Defendant's "C," the same being the drawing called for and marked as requested.

Cross-examination.

By Mr. BOOTH:

25 Ques. When you met Mr. Eppelsheimer in 1876 and he explained to you his invention, which he called a new style of tube,

did you fully conceive from his language of what that invention was?

194 Ans. Nothing further than the simple fact that the tube or subway was to be made out of an iron skeleton frame and a concrete surrounding or filling, both together forming the subway.

26 Ques. Afterwards when, in 1877, you saw the Clay-street extension in process of construction, did it strike you as being the invention which Mr. Eppelsheimer had previously disclosed to you?

Ans. I never gave the matter a thought.

27 Ques. Calling upon your memory at the present time, does it seem to you that the construction which you then saw progressing was a "skeleton frame of iron with a concrete filling" to it?

Ans. Undoubtedly.

28 Ques. What do you mean by yokes for the subway?

Ans. The yokes are the irons that are variously formed for tying the track rails and the slot irons together and giving the inside contour to the tunnel.

29 Ques. Do the yokes give a continuous contour to the interior of the tunnel?

Ans. Well, they do generally. Sometimes they are formed of several parts—the yokes are. I don't mean to say a continuous contour longitudinally, but continuous in cross-section, excepting the slot opening. There are cases, however, where the yokes do not complete the full circular contour.

30 Ques. What was the object of the concrete in the Clay-street hill extension?

Ans. I ought not to be asked to criticise that, for I did not examine it very thoroughly.

31 Ques. Where was it located with its relation to the cast-iron yokes?

Ans. I exemplify that in the Exhibit A.

32 Ques. Referring to Defendant's Exhibit C, can you tell whether the concrete in the Clay-street hill extension, at the time you saw it in process of construction, was located with relation to the yokes in a similar manner as the bent iron ties "A" of Exhibit C

195 are located with relating to the concrete E?

Ans. My recollection does not serve me sufficiently to answer that question with any certainty. My impression is there was considerable difference between the two forms.

33 Ques. Please state what that difference is.

Ans. Well, that I cannot do. That would be impossible. I could not remember it; too long ago.

34 Ques. On what data did you make Defendant's Exhibt B, purporting to be a cross-section of the Clay-street extension as it now is?

Ans. I took that from a drawing forming part of a paper read before the "Technical Society of the Pacific Coast," by Mr. W. W. Hanscon and by him authenticated as a true delineation of said construction.

35 Ques. Then, of your own knowledge, you do not know the

construction of the extension of the Clay-street hill railroad subway or tube?

Ans. I have sufficient knowledge of its construction to say positively that it is formed of concrete and cast-iron yokes shaped in such a manner as to bind together and carry the slot irons and the track rails. The only lack of knowledge I have on the subject refers to minute details of sizes, shapes, and proportion.

Counsel for defendant requests that the witness will, before closing this deposition, make such examination of the construction of the Clay-street hill extension railway as will enable him to verify the correctness of Exhibit B, which has been introduced to illustrate and represent such construction, or to produce a new exhibit which will correctly represent the construction as the case may require.

196 36 Ques. How often did you see the Clay-street hill extension in process of construction?

Ans. I certainly took but one good look at it, but I may have seen it two or three times when I had occasion to go in that locality.

37 Ques. Can you remember whether the yokes of that subway or tube were wholly imbedded in the concrete?

Ans. No; I could not tell that.

38 Ques. Then I will ask you how it is that you have been enabled to make from memory the tracing Defendant's Exhibit A, in which the yokes are plainly shown as not being wholly imbedded in the concrete.

Ans. It is plain enough. Simply I only show what I remember and leave the balance out.

39 Ques. Please indicate and mark with the letter "A" on Defendant's Exhibit "A" the yoke.

Witness takes Exhibit A and marks the letter A upon it in two places.

40 Ques. Please mark the concrete on the same exhibit with the letter E.

Witness takes Exhibit A and marks.

41 Ques. In the construction shown in Defendant's Exhibit A what is the function of the yoke "A"?

Ans. The function of the yoke A is to bind, support, and hold together the slot irons, track rails, and to form the interior contour of the subway.

41½ Ques. What supports the road-bed in Exhibit A?

Ans. The yokes, with a superstructure laid upon them, which I have not given in the sketch, because I cannot do it accurately.

42 Ques. Looking at the Defendant's Exhibit "C," can you tell me what supports the road-bed there?

197 Ans. The iron frame-work of the structure and the concrete.

43 Ques. Can you tell what is the difference in function of the concrete of the Clay-street hill extension tube and that of the California-street?

Ans. No; I don't know enough about the concrete in the Clay-street tube.

44 Ques. Does the concrete in the Clay-street support the road-bed?

Objected to by counsel for defendant on the ground that it is not proper cross-examination, and for the further reason that the witness has stated that he does not remember precisely the extent and disposition of the concrete in the Clay-street hill extension road.

Ans. I have not sufficient knowledge of the Clay-street subway to answer that question correctly.

45 Ques. Did you see the California-street cable road tube or subway while it was being constructed?

Ans. Yes.

46 Ques. Do you know the complainant in this case, Mr. Henry Root?

Ans. Yes, sir.

47 Ques. Do you know whether he had any connection with that road?

Ans. Yes; I knew Mr. Root was the engineer of the road.

48 Ques. You have stated that for a number of years you have had more or less to do with cable roads. I will now ask you as an expert in this branch whether or not durability is a requisite in a successful cable road.

Objected to on the ground that it is not proper cross-examination, and counsel protests against the counsel for complainant,
198 under the guise of cross-examination, examining the witness as an expert when he has been called and examined solely in relation to facts within his knowledge.

Ans. Undoubtedly it is.

49 Ques. Are you one of the counsel or one of the attorneys for the defendant?

Ans. I am employed by the defendant to procure testimony in this State for its defense and to furnish any facts within my own personal knowledge that may be needed in its defense.

50 Ques. In the interference proceedings of Root *vs.* Eppelsheimer, about which you have testified, have you any knowledge from Mr. Eppelsheimer or otherwise of what notice was given in instituting that interference?

Ans. No notice was received by Mr. Eppelsheimer; no notice reached Mr. Eppelsheimer which was sent by the Patent Office to him to his address in San Francisco, inasmuch as he was in Germany at the time.

Answer objected to as irresponsive and the question is repeated. The notary reads.

Ans. I have been informed by Mr. Eppelsheimer and have examined the records and ascertained that no notice was properly given or received; an attempted notice was given irregularly.

GEO. PARDY.

At this point adjournment was taken until Wednesday, November 9th, 1887, at 10 o'clock a. m., at the same place, it being understood and agreed that the witness Geo. Pardy might be called at a future date for redirect examination.

199 Office of Geo. Pardy, 402 Montgomery St.

SAN FRANCISCO, CAL., WEDNESDAY, *Nov.* 9, 1887.

Met pursuant to adjournment.

Present: Henry Root, complainant; W. F. Booth, his attorney; J. H. Dickinson, Esq., of counsel for defendant, and W. W. Hanscom, a witness produced on behalf of the defendant.

WILLIAM WALLACE HANSCOM, having been by me first cautioned and sworn to testify the whole truth before the commencement of this testimony, was carefully examined and his testimony reduced to writing by me, and he deposed and said as follows—that is to say:

By Mr. DICKINSON:

1 Ques. Please state your name, age, residence, and occupation.

Ans. My name is William Wallace Hanscom; my age, 48 years; residence, San Francisco, Cal., and occupation, mechanical engineer.

Counsel for complainant at this point enters his objection to the examination of this witness on the ground that his name is not mentioned in the notice, and notice is hereby given that a motion will be made to strike out the deposition of this witness on the said ground.

2 Ques. Have you had any knowledge and experience in relation to the construction of cable railways in the city of San Francisco and elsewhere; and, if so, for how long a time and in what places?

Ans. I have had experience in cable-railway construction in San Francisco. I made plans for cable railroad in London. I
200 have made plans for cable-railway machinery in Australia. That is all the places outside of San Francisco.

3 Ques. How long have you had any experience in regard to the construction of cable railways in San Francisco?

Ans. I think about five or six years; the time is longer than that, but not continuous; the time is from about 1874 to 1884.

4 Ques. Where was your place of business in 1876 and 1877, and what were you engaged in in that year?

Ans. I was proprietor of the Hope iron works, in this city, at the Potrero, San Franc.

5 Ques. Were you ever, as the proprietor of the Hope iron works, employed in the construction of any machinery or structure for use in building a cable railway either by illustrative model or otherwise? If so, please state the particulars.

Ans. In the latter part of 1876 I received an order from Mr. Henry Root to put together some iron-work representing a structure of iron-work for the California-street cable road. This work was

ordered some time during the month of December. Certain portions of the iron-work was furnished from the Pacific rolling mills and put together at my shop. From thence it was taken to the railroad offices, I think 4th and Townsend streets. I believe this iron-work was of the same form and construction as was afterwards used in building the California-street cable road.

6 Ques. You speak of this order as having been given by Mr. Henry Root. Was any one else associated with Mr. Root or did you receive directions from any one else in relation to the model?

Ans. No, sir; the instruction was from Mr. Henry Root.

7 Ques. Did you receive any directions or explanation or drawings from any one else except Mr. Root to aid you in constructing the model?

Ans. Mr. Wm. Epplesheimer came with Mr. Root and
201 brought some drawings which were discussed by Mr. Root, Mr. Eppelsheimer, and myself. My recollection is that the iron-work which was constructed was a modification of the drawings brought by Mr. Epplesheimer, although I cannot at this time recollect distinctly the various drawings that were brought by Mr. Eppelsheimer.

8 Ques. Please state in general terms the purpose and character of the structure of the drawings brought by Mr. Eppelsheimer, although you may not be able to describe specifically and in detail after this lapse of time.

Ans. The principle of the construction of this iron-work, as I recollect it, was the track rails and iron-work forming the slot were to be united with iron-work, so that when placed in the road-bed they would be held in position one with the other; as to the precise form of the iron-work composing the track rails and slot irons and the connecting parts I do not recollect.

9 Ques. What did Eppelsheimer's drawing illustrate or show in regard to the way in which this iron-work was to be used in constructing cable railway.

Ans. My recollection is that it was to make a continuous iron structure consisting of the track rails, slot irons, and iron-work for tying these parts together, which were to be placed in proper excavations along the street where the cable road was to be constructed, and then the earth was to be filled in around this iron-work, so that a conduit would be formed for the cable and grip to pass through. I think that some of the drawings showed that in portions of this tube the lower portion of this tube was to be formed of sheet-iron bent to the sectional shape of the tube, and that some of them were intended to have concrete in connection with the lower portion of it. I think there were four or five different drawings which were brought by Mr. Eppelsheimer and were discussed by Mr. Root and Mr. Eppelsheimer and myself.

202 10 Ques. Please explain the expression in your last answer, "intended to have concrete."

Ans. I don't know how I can explain it further than that concrete was to be used in connection with the iron-work.

11 Ques. You speak of having constructed a model after these

drawings; do I understand you to refer to a small model or full-sized illustration or section of the proposed road?

Objected to by counsel for complainant on the ground that the question assumes that the witness has testified to a fact which it is not in the recollection of counsel that such testimony was given, viz., that the witness constructed a model after these drawings.

Question withdrawn.

12 Ques. You state in your answer to question No. 7 that iron-work which was constructed was a modification of the drawings brought by Mr. Eppelsheimer, and in your answer to question No. 8 that the principle of the construction represented in the drawings brought by Mr. Eppelsheimer was that the track rails and iron-work forming the slot were to be united so that they would be held in position one with the other, and in your answer to question No. 9 that in some of the illustrations concrete was to be used to form the tube. Please state whether or not the structure which you thus made was a full-sized illustrative section of the proposed roadway.

Ans. The iron-work which I constructed for Mr. Root was a full-sized section of the iron-work as proposed for California-street road.

13 Ques. Did you ever see this structure afterwards?

Ans. Yes, sir.

14 Ques. At what time and place and what was its condition?

203 Ans. The place was in the yard of the railroad buildings, Fourth and Townsend streets, in this city. The iron-work was imbedded in a mass of concrete the interior of which formed the tube. The time I do not recollect exactly, but I think it several weeks after the iron-work left my shop.

15 Ques. Please state about when this was that it left the shop; or state what year and parts of the year, if possible, that you thus saw the completed road section.

Ans. I think in January or February, 1877.

16 Ques. I now show you Defendant's Exhibit C and ask you to state what this represents, if you know.

Ans. This represents generally, I think, the iron-work that I constructed for Mr. Root.

17 Ques. What does it represent besides the iron-work?

Ans. Concrete, in which the iron-work was encased. I recollect that the iron-work was imbedded in the concrete at Fourth and Townsend streets.

18 Ques. Is this Exhibit C, then, a substantially fair representation of the illustrative road section as you saw it at Fourth and Townsend streets in the early part of 1877?

Ans. My recollection, yes; with the exception of the line of concrete on the inside forming the tube, which I believe were carried up straight, and the openings between the concrete and the slot irons were closed by a plate of iron extending from rib to rib.

19 Ques. From what occurred at your works regarding the construction of that model, do you understand that Mr. Eppelsheimer was in consultation with Mr. Root in regard to its construction?

Ans. Partly; yes.

20 Ques. Now, please state, if you can, in what particulars the features of the Eppelsheimer drawings were departed from in the model you constructed by Mr. Root's orders.

204 Ans. I cannot state particularly or definitely, only that these plans were discussed, and the resulting construction was a modification of the plans brought by Mr. Eppelsheimer.

21 Ques. What connection was there between the railroad office at Fourth and Townsend streets, where this model was kept, and the California-street cable railway, and what connection had Mr. Root with these matters, if you know?

Ans. I must answer that by giving common report, which was that the Central Pacific railroad people at Fourth and Townsend streets were largely interested in the construction of the California-street cable road, and that Mr. Root was the constructing engineer for that road.

22 Ques. When Mr. Root gave the order for the model or structure which you have referred to, did you understand whether this was on his own account or on behalf of the California-street cable road of which he was the constructing engineer?

Ans. I supposed on behalf of the California-street road, although the work was ordered in Mr. Root's name, bills made out in his name, and audited by him.

23 Ques. Do you know who paid the bills?

Ans. I do not know personally; they were collected at Fourth and Townsend streets by my book-keeper at the railroad office.

24 Ques. Was the California-street cable road—that is to say, the road-bed and the cable conduit thereof—constructed in substantial accordance with the road section in regard to which you have testified, that the iron-work was made by you, and it was afterwards filled in with concrete, leaving a slotted tube or cable conduit?

Ans. It was.

25 Ques. Defendant's Exhibit C, then, is substantially a fair representation of the road-bed and cable conduit of the California-street cable railway?

Ans. Substantially it is, with the exception of the errors and omissions before alluded to. It is like it, inasmuch as it
205 comprehends the united track rail and slot irons embedded in concrete. The omission is in the form shown in the sketch before alluded to.

26 Ques. How long has the California-street cable railway *be* in public use?

Ans. Since the spring of 1878—I think April.

27 Ques. Are you familiar with the construction of the road-bed and cable conduit of the Clay-street hill extension cable railway in this city?

Ans. Not perfectly.

28 Ques. Please explain what you do know about it.

Ans. It is formed, I believe, generally of iron and concrete, the track rails and slot irons being united by castings instead of by

wrought iron, as used in the California-street road while I visited it several times during its construction. I have no definite recollection in regard to the arrangement of concrete in connection with the iron-work.

29 Ques. Have you ever published an illustrated description of the yokes for iron supports for the track and slot rails of the California-street and Clay-street hill cable railways respectively?

Ans. I have in a paper which I read before the Technical Society of the Pacific Coast, in which illustrations were given intending to represent very nearly the form of the iron-work uniting the track rails and slot irons on both of the above-named roads.

At this point adjournment was taken until Thursday, November 10, 1887, at 10 o'clock a. m., at the same place.

206 Office of Geo. Pardy, 402 Montgomery St.

THURSDAY, *Nov.* 10, 1887.

Met pursuant to adjournment.

Present: Henry Root, complainant, and W. F. Booth, his attorney; J. H. Dickenson, for defendant, and the witness, W. W. Hanscom, whose examination was continued as follows:

30 Ques. Mr. Hanscom, you speak of the drawing Mr. Eppelsheimer brought to the works from which the model was constructed that was afterwards seen by you at Fourth and Townsend streets, containing several—one or more—illustrations of different styles of tubes or subway. Did you understand that all these were of Mr. Eppelsheimer's design?

Objected to on the same ground as the objection to question 10.

Ans. That question is not what I stated.

31 Ques. You used the language in answer to Ques. 9 as follows: "I think that some of the drawings showed that in portions of this tube the lower portion of this tube was to be formed of sheet-iron." Now, please explain this answer what you mean by "some of the drawings."

Ans. I mean just exactly what I said and not that Mr. Eppelsheimer brought drawings of various kinds of tubes. I also said that the model that was constructed at my shop was a modification of these drawings or what was shown in these drawings by Mr. Eppelsheimer.

32 Ques. Did the drawings that Mr. Eppelsheimer exhibited to you exemplify in substance all the material features of the model which you saw at Fourth and Townsend streets?

207 Ans. I do not recollect. My recollection is that those drawings embodied what I call the principle of construction, comprehending the uniting of the track rails and slot irons by other iron-work.

33 Ques. Did not Mr. Eppelsheimer consult with you and Mr. Root in regard to the construction of the model?

Ans. He did.

34 Ques. So that you obtained the impression that he was the designer of the tube which the model we spoke of exemplified?

Objected to on the grounds that it is highly improper, in that it is leading and assumes more than the testimony warrants.

Ans. I cannot go so far as that.

35 Ques. What were, as near as you can tell, the changes made from the drawings in constructing the model?

Ans. It will take some little explanation to answer that question.

36 Ques. Then please give those explanations as fully and completely as you can.

Ans. It is usual and customary in bringing original plans to a shop for constructing new work, or from new designs, to discuss them in their general features, and to make such modifications and changes in the design or in its details as may be suggested and agreed upon between the parties discussing the subject. In this respect and manner the drawings which were brought by Mr. Eppelsheimer were discussed, and such changes were decided upon as were deemed necessary and for the more perfect construction of this portion of the iron-work for the California-street road.

37 Ques. Mr. Hanscom, the question was, what was the change? Cannot you give specifically the nature of them?

Ans. I cannot specifically.

38 Ques. Can you give any of them; some of them; one of them?

208 Ans. No; I think not. I can say a little more in regard to that answer, and that is, that some of the changes were in regard to the arrangement of details and strength of the construction and methods of fastening together. That is as far as I can give of my recollection of the changes.

39 Ques. Viewing that model on 4th and Townsend streets, without reference to details of arrangement of the iron-work, method of fastening, or other details, which may have been the subject of change or alteration, would you take it as an exemplification of Eppelsheimer's drawing?

Ans. Is that a question of fact or a question of opinion as an expert?

40 Ques. That is merely a question of fact. You can tell when you see a model whether it follows the drawing you have previously seen?

Ans. How can I if I don't recollect the drawings?

41 Ques. Then, do you state positively that you have not sufficient knowledge of the Eppelsheimer drawings to state whether the general principles of the design of subway illustrated by those drawings was carried out in the model you assisted to make from them?

Ans. That is a question of opinion and not a question of fact. You said you wanted a question of facts.

42 Ques. Please answer the question so that we can understand this matter, independent of your views as to whether it is an opinion or a question of fact.

Ans. I don't know how to answer that question.

43 Ques. Can you tell us, Mr. Hanscom, if the model you saw at 4th and Townsend streets was constructed of an iron frame-work and concrete in combination therewith?

Ans. Yes.

44 Ques. You answer to question 9, "The lower portion of
209 this tube was to be formed of sheet-iron, bent to the sectional shape of the tube, and that some of them were intended to have concrete in connection with the lower portion of it. I think there were four or five different drawings which were brought by Mr. Eppelsheimer and were discussed by Mr. Root and Mr. Eppelsheimer and myself."

Then, in the matter of their being a combination of iron frame and concrete some one of Eppelsheimer's drawings illustrated that?

Ans. I think I answered that question in nine or ten. I don't recollect the number of the question.

45 Ques. Please answer it again.

Ans. I do not recollect whether the drawings showed concrete tube in connection with the iron particularly, but my recollection is that there was iron and concrete in combination on some of the drawings.

46 Ques. Were there any other drawings presented to you to guide you in the construction of this model besides those furnished by Mr. Eppelsheimer?

Ans. None that I have any recollection of, except what drawings I may have made myself.

47 *Ans.* Did you know, about the early part of 1877, that patent had been applied for or had been issued to Mr. Eppelsheimer for the construction as exemplified by the model?

Ans. I did not.

48 Ques. When did you know that, if ever, as near as you can tell?

Ans. The first recollection that I have at present on my mind was when Mr. Eppelsheimer spoke to me about it in connection with the use of concrete in the construction of cable railways when I was in London some time during the year 1883 or latter part of 1882. I may have known of it previous to this, but I cannot now recollect if I did.

210 49 Ques. Have you ever informed anybody, in discussing the origin of the particular construction of tube exemplified by the model we have been speaking of, that you, as a matter of fact, had understood it to be mainly of Eppelsheimer's design?

Ans. I do not recollect.

50 Ques. If you had so informed anybody, would it have been true or false?

Objected to on the ground that it is improper and incompetent.

Ans. What true and what false? I do not understand what is referred to.

The notary reads to the witness questions No. 49 and 50, and witness—

Ans. I don't know how to answer that question.

51 Ques. You may answer it by stating whether you did or did not inform anybody of your views on the question, or whether, supposing you have forgotten, whether it would have been true or false had you so informed anybody. That is purely a question of fact.

Objected to on the ground that the question is unintelligible.

Ans. I don't know how to answer it.

52 Ques. Did you or did you not at any time hold the opinion that the model on Fourth and Townsend streets, which we have discussed, in the main exemplified Eppelsheimer's invention?

Ans. I don't know whether I did or not.

53 Ques. Now, can you state positively that you have not communicated your opinion upon that question to others or to one other?

Ans. On the contrary, it is very possible that I have communicated my opinion on that subject at various times during the last four or five years.

211 54 Ques. Then will you state whether your opinions so communicated were favorable or unfavorable to Eppelsheimer's title to the invention?

Ans. Please show me his invention.

55 Ques. I will state the claim of invention made by Mr. Eppelsheimer, and it is in relation to this claim I will confine my question. This claim you will take as a description of the invention:

"Claim.—In a tramway track for wire-rope railroads, a tube to receive the rope or cable, made of concrete or equivalent material, open at the top and combined with iron ribs."

Ans. My recollection is that my opinions, if any were given on that subject, were that Eppelsheimer was the first and original inventor of that system or method of construction of cable railway tubes and track.

56 Ques. Do you remember at what time the Clay-street extension railway—that part extending from Leavenworth to Van Ness avenue—was constructed?

Ans. My recollection is, during 1877.

57 Ques. Do you know—if so, please describe in a general way—how the subway was constructed?

Ans. My recollection is that a trench was dug in the street, and that castings of iron, to which the rails and slot irons were attached, were placed in the trench, and that concrete was placed around them, but as to the shape of the structure of concrete or form given it in putting it in the trench I do not recollect, although I was on the line of the road several times during its construction.

58 Ques. Do you remember sufficiently to state if the concrete was so disposed as to form the interior contour of the ropeway or tunnel?

Ans. I do not recollect, but I think it was.

59 Ques. Can you state for what purpose the concrete was applied?

Ans. That is a matter of supposition on my part.

60 Ques. I now exhibit to you, Mr. Hanscom, a copy of "Transactions of the Technical Society of the Pacific Coast," in
212 which appears an article read by W. W. Hanscom June 6, 1884 (showing). Do you acknowledge the production of that paper?

Ans. Yes.

61 Ques. Will you please read the paragraph I have marked in pencil?

Ans. (The witness reads:) "The tube in the extension is formed of concrete, and as it passes through the openings of the frame it forms a monolithic structure the length of the road to which this mode of construction is applied."

62 Ques. Then, must we understand from this description that you give that the Clay-street hill road extension has "a tramway track for wire-rope railroads to receive the rope or cable, made of concrete, open at the top and combined with iron ribs"?

Ans. Most assuredly.

63 Ques. How much time, if any, would it take to demonstrate the practical usefulness of such a construction?

Question withdrawn.

64 Ques. Mr. Hanscom, have you ever seen road-beds constructed with concrete foundations?

Ans. Yes.

65 Ques. Were such constructions common prior to 1876?

Ans. I can only give my opinion on that subject.

66 Ques. What do you know, Mr. Hanscom, as a matter of fact, as to the use of concrete for ordinary road-beds or for railroads?

Ans. I have seen it put down in London, both for common streets and for street railroads.

67 Ques. Do you know if this form of construction is of comparative recent origin, or does it date back?

Ans. I don't know; it is a matter of opinion with me.

68 Ques. Have you read up on this subject in books?

213 Ans. Yes.

69 Ques. Then you must have some knowledge in a professional way as to the age of the invention. If so, please give us your views.

Ans. As a professional man?

70 Ques. No. As a matter of fact you have read in books. Now, tell us your recollection of the matter and give us an idea of its age.

Ans. My recollection is that I have read considerable on the construction of roads, but in regard to the question of its antiquity I am not prepared, with my present recollection, to state how far back the earliest use was made of concrete in the construction of roads.

71 Ques. From your knowledge can you safely say that concrete for road-beds had been in use at least eleven years?

Ans. I cannot say from my own personal knowledge, except such

as obtained by reading, that roads constructed with the use of concrete were in vogue prior to 1876.

72 Ques. You say, then, from your reading reliable standard works, that you have ascertained that concrete roads were established prior to 1876?

Ans. No; I don't.

73 Ques. What do you object to in the question?

Ans. The question says I was reading standard works, and I do not say anything of the kind.

74 Ques. Have you not read standard works on this subject; if not, what kind of works have you read?

Ans. I have read Patent Office reports and I think I have one or two works on road-making and its construction in my library which I have read, and I have read articles on this subject, I think, in periodicals—in journals. I think I have a series of articles on road-making in some copies of the journal of the Franklin institute. I have Gilmore's work on—I think it is called "Limes and Cements," which, I believe, has some remorks concerning the uses of concrete in various constructions.

214 75 Ques. From this list of books you give, can it reasonably be established that concrete roads were known and in use prior to 1876?

Ans. In order to give an intelligent opinion, it would be necessary for me to refer to the works I have enumerated.

Recess until 2.15 p. m.

76 Ques. Do you not know the date of publication of some of those works that contain a description of concrete roads?

Ans. I do not.

77 Q. How long have you had those works in your library?

Ans. Some of them 10 or 15 years, I think, and some I have not had at all.

78 Ques. In any of those works that you have had from 15 to 20 years, are there any accounts or descriptions or informations given of concrete roads?

Ans. I don't recollect.

79 Ques. When did you say you were in London, at the earliest?

Ans. In June, 1882.

80 Ques. Did you then see roads constructed of concrete foundations in the city of London?

Ans. I think I did during that month.

81 Ques. Did these roads have the appearance of being newly constructed or did they have the appearance of age, so that you could reasonably assume that some of them had been in use some time previously, as far back as 1876?

Ans. Will the answer to that question depend on my ability as a professional man to answer as to the age of a road?

82 Ques. Answer it in any way you choose.

Ans. During the time I was in London I recollect that on one street, the name of which I do not at present recollect, some rails were being put down for street railroads. It was where there was

another track, and new construction was replacing the old.
215 In this new work concrete was used as a substructure and filling between the rails, which were quite deep, and on top of this concrete was placed block paving. My recollection is that in taking up the old track concrete was removed. As to its question of age, that is a professional one and I decline to answer unless I am asked professionally.

83 Ques. We ask you simply as a matter of fact, did the structure look old or new that was removed? I mean the concrete portion.

Ans. I don't know whether it was old or not.

84 Ques. We did not ask you whether it was old or not; we ask you as to its appearance generally.

Ans. You did not ask me as to its appearance generally.

85 Ques. We do so now.

Ans. I don't recollect.

86 Ques. What is the general reputation of concrete as a structure for the foundations of tramway road-beds, as to its durability?

Ans. I have never inquired of anybody about it.

87 Ques. Do you not know of your own knowledge?

Ans. I do not know anything about the general reputation.

88 Ques. What is your own view on the subject?

Ans. Professionally?

89 Ques. We ask what is your own knowledge on the subject, professionally or otherwise, as you may wish to construe it? What are your views?

Ans. Do you ask my professional opinion?

90 Ques. I ask you from your own knowledge, from practice which you must have had as an engineer and from the experience and practice of others, which you must have ascertained as part of your education as an engineer?

Ans. I decline to give my professional opinion unless I am employed as a professional.

216 91 Ques. How long has the Clay-street hill R. R. extension been in public use?

A. I think since the first of 1878. My recollection is that the change in the engine power for operating the extension was made about the latter part of December, 1877, and that the extension was being operated about the first of the year 1878.

92 Ques. You said in your answer to question 26 that the California-street cable railway has been in public use since the spring of 1878. Please state if it has been constantly in public use since, if you know, ordinary delays and interruptions excepted.

Ans. It has, so far as I know.

93 Ques. We are to understand, then, that the company has been collecting passenger fares on said road as a regular thing during this time?

Ans. I believe it has.

94 Ques. Have you been in the employ of what is called the Cable Railway Company, or the Traction Railway Company, or the Na-

tional Cable Railway Company, or Mr. Henry Root? If so, please state the fact of said employment.

Ans. I think I was in the employ of Mr. Root once. Some years ago, I don't recollect the exact date, Mr. Root employed me to indicate the engines of the California-street road. That is all the employment that I know of as being engaged in for Mr. Root. I don't know whether I was ever in the employ of the National Cable Railway Company or not. The other two companies whose names you gave I don't know whether I was in their employ or not.

95 Ques. Have you been employed by any individual whom you know to be connected with and acting in the interest of any of the above-named companies?

Ans. Yes; I think so. I will have to qualify that by saying I don't know why I qualify—that is, because the question was
217 as to the person acting in the interest of these companies or either of them.

96 Ques. Please state if you have been employed by anybody for the benefit, directly or indirectly, of any of the above parties; and, if so, state the nature of the employment.

Ans. I believe that is a professional question and I decline to answer it.

Cross-examination:

Counsel for complainant, not waiving the objection heretofore made to the testimony of this witness on the ground that his name does not appear in the notice, proceeds to cross-examine the witness.

By Mr. BOOTH:

97 X Ques. Are drawings usually furnished to shops of the nature of the Hope iron works, of which you were proprietor, for the purpose of manufacturing from them?

Ans. Yes; for new construction work.

98 X Ques. Who takes charge of the drawings which are thus furnished?

Ans. In my case, I do.

99 X Ques. Did you take charge of and keep in your possession the drawings about which you have testified as being brought by Mr. Eppelsheimer upon the occasion of his visit to you with Mr. Root?

Ans. My recollection is that the drawings were in my general charge while they were under discussion and while they remained at my works.

100 X Ques. Did you construct the model heretofore referred to by you from the Eppelsheimer drawings or from working drawings which you made yourself under the instructions of Mr. Root?

218 Ans. My recollection is that the particular construction, wherever it was changed from the drawings that was brought by Mr. Eppelsheimer, were from drawings that I made myself, which were agreed to and accepted by and the work ordered to proceed with by Mr. Root.

101 X Ques. Did you, as a matter of fact, work direct from Eppelsheimer's drawings in making that model?

Ans. I think not.

102 X Ques. Do you remember that when you first received the order to construct that model Mr. Root called upon you alone and gave you such order?

Ans. I do not.

103 X Ques. In your recollection, does it seem to you that all the consultations concerning the model were held in the presence of Mr. Eppelsheimer?

A. No; not all.

104 X Ques. Do you not remember that upon the first visit which Mr. Root and Mr. Eppelsheimer made together upon you Mr. Eppelsheimer had in his possession a roll of drawings on white paper and which illustrated a new grip and other portions of a cable railway structure, and that after you three had discussed those drawings Mr. Eppelsheimer carried them away and did not bring them back again?

Ans. While it is very possible that Mr. Eppelsheimer may have brought with him drawings on white paper representing a grip and other portions of cable railway structure, and that he may have taken away with him those dsawings, I do not recollect the circumstance.

105 X Ques. Do you not recollect that the next day or a short time afterwards Mr. Root and Mr. Eppelsheimer called again upon you, bringing this time a drawing on yellow paper, said drawing being, when first brought, simply an outline, and that you
219 filled in that drawing as the result of your consultation, and that you worked from that drawing in making the model?

Ans. While that may have been the case, my recollection does not go to that extent; that in discussing these drawings which were brought by Mr. Eppelsheimer and which, I think, were on yellow or brown paper, and that in discussing them more or less lines were added to them by pencil or otherwise. I think that what work was done in regard to putting together the iron-work of this model was done through drawings or sketches outside of the drawings brought by Mr. Eppelsheimer.

106 X Ques. Was not Mr. Root the principal in this employment of your services, as far as Mr. Eppelsheimer was concerned?

Ans. Yes, I think so.

107 X Ques. Did he not take the lead in your consultations and did you not look to him as the leader in this matter?

Ans. While Mr. Root may not have taken the lead in the discussion of these drawings of this work, everything that was done on this construction model and in the adoption of any plans was subject to the approval of Mr. Root.

108 X Ques. I will ask you whether, at that time, you did or did not understand or consider that the structure thus developed to you was of Mr. Root's invention?

Ans. No, I did not; I thought that the invention was from Mr. Eppelsheimer and that he brought it to Mr. Root for his approval, and that what was evolved in the discussions and final plans and construction of the model was the result of the modifications of these plans brought in by Mr. Eppelsheimer.

109 X Ques. Did you not, during the construction of this model, upon one occasion when it seemed to you that Mr. Eppelsheimer was unduly interfering with the work, say to him, "I don't know you in this matter"?

220 Ans. I have no recollection of any circumstance of that kind occurring.

110 X Ques. Did you meet Mr. Eppelsheimer in London frequently?

Ans. I think I met him, perhaps, six or eight times. I don't think it was a dozen times.

111 X Ques. Did he at that time speak to you about the interference which Mr. Root had obtained in the Patent Office with his patent No. 193,757?

Ans. I do not recollect that he did about the interference.

112 X Ques. Do you know where the headquarters of Mr. Root were in this city about the time that your bill for the making of the model was rendered?

Ans. I think it was in the building corner Fourth and Townsend streets.

113 X Ques. Is that the reason that you sent the bill down there?

Ans. I think that wherever the bill was sent to be collected it was in accordance with directions of Mr. Root.

114 X Ques. Did you not look to Mr. Root for the payment of that bill?

Ans. Yes; I will say in connection with that that I had at various times done other work by Mr. Root's order, and I believe that the bills were all paid at the railroad building.

115 X Ques. Mr. Root's office was in that building, was it not?

Ans. I am not positive in regard to that. I do not know whether I visited Mr. Root at his office before the construction of this model, but that afterwards, during the construction of the California-street road, I was at his office frequently, in the building at Fourth and Townsend streets.

Adjourned to 10 o'clock a. m., Friday, November 11, 1887, at the same place.

221 Office of George Pardy, 402 Montgomery street.

FRIDAY, *November* 11, 1887.

Met pursuant to adjournment.

Present: Henry Root, complainant, and W. F. Booth, his counsel; J. H. Dickinson (by consent), counsel for defendant, and the witness, William W. Hanscom, whose cross-examination was continued as follows:

By Mr. BOOTH:

116 X Ques. In what capacity, if any, was Mr. Root, the complainant in this case, connected with the California-street cable road?

Ans. Constructing engineer, I believe.

117 X Ques. Do you know whether his connection with this road

lasted throughout the time of its construction and afterwards for a number of years?

Ans. So far as the time during the construction of the road was concerned I think he was constructing engineer; but at the time the road was commenced running for passengers I think it was turned over to the operating department, and whether Mr. Root severed his connection as constructing engineer of the road at that time, I do not know.

118 X Ques. Can you fix the year in which you were employed by Mr. Root to indicate the engines of the California-street cable road?

Ans. I can, by refreshing my memory from notes I had taken at the time. Mr. Root employed me to do so. I think it was two or three years after the completion of the road; perhaps more.

119 X Ques. Was he not at that time connected with that road?

Ans. That I do not know, but I suppose so.

222 120 X Ques. Would you not judge from the fact of his employing you to do this work that he was so connected?

Ans. Certainly; that he was connected with the road, but whether as constructing or consulting engineer, of course I don't know.

121 X Ques. Can you say whether as a matter of fact there is any difference in the construction of the Clay-street hill extension road-way and that of the California-street cable road?

Ans. Yes; the Clay-street road has a form of cast iron connecting the track rails and the slot irons and the California-street has a bent rail of wrought iron; connection between the rails and slot irons.

122 X Ques. Is the disposition of the concrete the same in both constructions?

Ans. I am not certain that it is just the same. The contour or form or cross-section of concrete in the Clay-street road is possibly different from that in the California-street road.

123 X Ques. Does not this difference result in an entire difference of function of the two concrete bodies?

Counsel objects to the above question on the ground that it is not proper cross-examination, no question of an expert nature having been asked.

Ans. That being a professional question, I decline to answer.

124 X Ques. I now show you Defendant's Exhibit B and ask you whether that is a fair representation of a cross-section of the Clay-street hill extension road-bed and subway.

Ans. From the extract which I read yesterday from the paper which I had read before the Technical Society I do not think this a correct representation of the subway of the Clay-street railroad extension.

223 125 X Ques. In what particular does it fail?

Ans. In that description which I have just alluded to. The tube in the extension is formed of concrete, and as it passes through the openings of the frame it forms a monolithic structure the length of the road to which this mode of construction is applied. In this exhibit the outline shown of the concrete portion does not

seem to pass through any openings in the casting, and in this sense is different from the Clay-street tube as constructed.

126 X Ques. Would you correctly apply the language which you have just quoted from your own paper to the construction of the California-street cable roadway?

Ans. Not exactly.

127 X Ques. In the California-street construction does the concrete pass through openings in the frame-work?

Ans. It does.

128 X Ques. Is it not a fact that, although your last answer may be technically correct, the frame-work in the California-street road is wholly and completely imbedded in the concrete, which forms not only the tube itself, but the entire foundation for the frame-work and the roadway?

Ans. I have forgotten just how far outwardly the concrete extended in the California-street road, but I think it extended to and under the rails.

129 X Ques. Was this the case in the Clay-street extension construction?

Ans. I do not recollect about that.

130 X Ques. Is it not a fact that in the Clay-street hill extension construction the castings which form the frame of the structure and which are lettered "A" in Defendant's Exhibit B are not embedded in the concrete?

Ans. I do not recollect as to whether concrete is first put down and then the castings set upon it or whether they are set down on the soil and concrete filled in between and through them.

224 131 X Ques. In the Clay-street hill extension construction can you state what supports the roadway pavement or planking?

Ans. It is supported by the iron castings which unite the track rails and slot irons.

132 X Ques. Does the concrete support it?

Ans. Inasmuch as the concrete extends the length of the road and includes in its mass the castings, it assists to support the castings, and secondarily the pavement.

133 X Ques. Is it not a fact that in the Clay-street construction the concrete merely forms the tube or channel for the travelling rope, and that no reliance is placed on its strength, but that the castings form the support and foundation for the structure?

Ans. I do not know what the opinions were of the constructing engineer nor the opinions of those who had the road built as to what portion of support was to be given by concrete and by the castings.

134 X Ques. Do not the castings form the support and foundation for the structure in the Clay-street hill extension?

Ans. Partly.

135 X Ques. Do you know upon what the pavement between the track rails and the slot irons in the California-street cable road rests?

Ans. I do not recollect particularly, but I think that an iron

plate is laid upon the concrete, closing an opening between that and the slot irons, and that this plate extends about half way between the tube and the rails, and that the paving rests upon partly the concrete directly and partly upon this iron plate.

13- X Ques. In the Clay-street hill extension construction does the planking which extends between the track rails and the slot irons rest on the concrete?

Ans. I think not at all.

225 137 X Ques. In the Clay-street hill extension construction do the walls of the central openings in the castings of the frame-work project into the tube or are they completely covered by the concrete?

Ans. I think not. I think that the castings, the inner contour of the castings, is not covered by the concrete.

138 X Ques. What do you mean by the words "through openings in the frame-work" used in your quotation from the paper which you read before the Technical Society?

Ans. I mean that the web of the castings between the contour of the tube and the outside lines of the castings had perforations in them.

139 X Ques. When you were in London did you mention to Mr. Eppelsheimer that there was an interference instituted by Mr. Root with his (Mr. Eppelsheimer'-) patent?

Ans. I have no recollection of doing so.

140 X Ques. You state in answer to Ques. 48 that your first recollection that you have at present of the first knowledge you acquired of the fact that Mr. Eppelsheimer had a patent for the construction exemplified by the model you made was when Mr. Eppelsheimer spoke to you about it during the year 1883 or the latter part of 1882. Did you not know of it before you went to London?

Ans. If the testimony taken in the interference case was before I went to London I must have *have* known it, because I think I was called upon to give some testimony in that case.

141 X Ques. Were you not a witness on behalf of Mr. Root in that interference case?

Ans. I think that Mr. Root called upon me for my testimony in regard to certain facts.

142 X Ques. Did you ever know or hear of this plan or method of constructing cable roads, and which comprise the combination of an iron frame-work forming the track rails and slot irons, with a foundation of concrete, before your consultation with Mr. Root and Mr. Eppelsheimer?

226 Ans. Not that I have any recollection of.

143 X Ques. Was the old Clay-street hill road constructed in this manner?

Ans. It was not.

144 X Ques. Can you not state, as far as you know, that the California-street road, as far as the construction of its road-bed is concerned, was the first of its kind?

Ans. As far as I know and can recollect, the California-street road was the first that was constructed for a cable railway in which the

iron-work uniting the track and slot irons was embedded in concrete, and that about the time of the construction of this road that the Clay-street hill extension was constructed, in which the use of castings uniting the rails and slot irons was used in connection with concrete.

145 X Ques. In the previous answer why do you make the distinction between the two roads by using the words "embedded in concrete" in the one instance and the words "in connection with concrete" in the other instance if you regard the two roads as being sufficiently identical in construction to embody them in the same answer?

Ans. I gave the answer because I understood that the question implied as to my knowledge of the construction of cable roads in which concrete and iron was used, and that castings were used in one road while wrought iron was used in the other, and both used concrete.

Recess until 2.30 p. m., at which time the witness was re-examined as follows:

146 Ques. You say in one of your answers that your recollection is that the model was not constructed from Eppelsheimer's original drawings direct, but from other drawings which you had made. Is it not the practice in machine shops to preserve original
227 drawings and furnish from them what are known as shop drawings, these generally being on a larger scale?

Ans. It was my usual custom when general plans were brought to me to make detail drawings for shop use, to various scales, keeping the general plans in the office. That I believe to be in accordance with the usual custom of machine shops.

147 Ques. You state in one of your answers that the disposition of the concrete is possibly different in the two roads, the California and the Clay street. Can you state whether both these roads have a tie connecting the rails and forming an upright support to the slot iron in connection with the concrete foundation?

Ans. I have given you my recollection of the construction of the two roads; professional opinions I decline to give.

148 Ques. We are not asking you for a professional opinion; we are asking you a simple matter of fact.

Ans. The simple matters of fact within my recollection I have already given.

149 Ques. Did you see in the California-street and the Clay-street road- any tie connecting the rails which also supplied a support to the slot iron?

Ans. I have already stated my recollection of the connection between the rails and slot irons. I have already given you and shown by the exhibits the general features, to the best of my recollection.

150 Ques. We do not ask you whether you have or not; whether you have answered before should not prevent you from answering again; it will save time.

Ans. I refer you to my answer already given.

The notary is instructed to read question No. 149 to the witness and insist upon an answer thereto.

The notary then reads to the witness the above question, No. 149.

228 Ans. I do not recollect.

151 Ques. You state that you were a witness in an interference case in the Patent Office between Mr. Root and Mr. Eppelsheimer touching the subject-matter in issue in this case. Did you give evidence in that examination tending to establish the fact that Mr. Eppelsheimer was the inventor or designer of the device illustrated by the model of which we have spoken?

Objected to for the reason that it is not seen that the issue of the present cause is priority of invention between Mr. Root and Mr. Eppelsheimer, as the question implies.

Ans. As some length of time has passed since that evidence was given, I will have to refer you to the records of that testimony for its correct version, but I have no recollection of saying anything in reference to Mr. Eppelsheimer in that testimony.

152 Ques. Do you not recollect having stated to anybody within the past few months that you knew Eppelsheimer was the inventor of the subject of the device shown in the model, and that the reason you did not so testify upon the examination in said interference was because the question was never asked you?

Objected to as not a proper question on re-examination.

Ans. No, sir.

153 Ques. Do you now state that you made no such remark to any one?

Same objection.

Ans. No, sir.

154 Ques. Then you simply don't recollect the matter. Is that what we are to understand?

Same objection.

229 Ans. I don't know what you are to understand. I only said no to your direct question. Now, I will explain: Your first question — in reference to my stating or asking me if I did not state to some one within some months past that I knew that Eppelsheimer was the inventor of the device alluded to; to that question I say no, positively; to the part of the question as to whether I had ever stated the reason why I did not say anything about Eppelsheimer was because it was not asked me I will answer that it is very possible that I may have so stated numbers of times since that testimony was taken, and the answer no to question 153 was a correct answer.

155 Ques. Mr. Hanscom, in one answer you say, As far as I know, the California-street road was the first in which the iron-work for the track was embedded in the concrete, and that at about the same time the construction of the road on Clay street was going on. Do

you feel, Mr. Hanscom, sufficiently positive to give either road the preference in point of time?

Ans. I feel quite positive that the construction of the California-street road, by which I mean the active or street construction, was commenced before the Clay-street.

156 Ques. Referring to the Defendant's Exhibit B, you stated, if I correctly remember, that to properly represent the Clay-street hill construction it should show the concrete passing through openings in the yoke, and in another answer you stated that the concrete does not cover the internal contour of certain openings of the yoke. Now, please explain which opening it is that the concrete extends through and which you refer to as not having their internal contour covered.

Ans. The openings in the castings through which the concrete passes are those between the centre and the outside, and the openings through which the concrete does not pass are those
230 which form the outline of the conduit through which the cable passes. I am speaking from my recollection.

W. W. HANSCOM.

Adjourned to Saturday, November 12, 1887, at same place, at 10 o'clock a. m.

Office of George Pardy, No. 402 Montgomery street.

SATURDAY, *November* 12, 1887.

Met pursuant to adjournment.

Present: Henry Root, complainant; W. F. Booth, Esq., counsel for H'y Root; J. H. Dickinson (by consent), counsel for defendant, and the witness, Geo. Pardy, recalled for re-examination.

By Col. DICKINSON:

51 Ques. Have you made a personal examination of the Clay-street hill extension road since making the former part of your deposition?

Ans. I have.

It is admitted by the respective counsel that the Clay-street hill extension road-bed is constructed with castings which rest on sand, and that the track rails and slot irons are supported by the castings, which also support longitudinal stringers, upon which the surface planking which forms the roadway rests; that the tube is formed of concrete extending between the castings, and that said tube is open at the top.

Defendant now proposes to admit any testimony taken in
231 the interference proceedings in Patent Office between Henry Root and the patent of Wm. Eppelsheimer to be incorporated in this case, providing the witnesses giving such testimony are now produced for the purpose of cross-examination.

Complainant, not being prepared at present to enter upon his rebuttal, respectfully declines the above proposition.

52 Ques. To the best of your knowledge and belief, Mr. Pardy, have the Clay-street hill extension cable road and the California-street cable road, to which you have referred in this deposition, been in regular use collecting fares from the public since they were opened in 1877 or 1878?

Ans. They have.

53 Ques. State, if you know, for whom the California-street cable railway was built or by whom was it built—by what company, if a company.

Ans. I think the name of the company is the California Street Cable Railway Company.

54 Ques. You are clear, then, that it was built by a joint stock company?

Ans. Yes; it was built by a joint stock company.

55 Ques. State, if you know, by whom the stock of this company was principally held.

Ans. As far as my knowledge and belief is concerned and from common report, Messrs. Leland Stanford and Charles Crocker were the principal owners.

56 Ques. Do you understand that they held a majority or the stock?

Ans. I could not tell you that. It was generally understood that the Central Pacific railroad people were the projectors and principal owners of the road and controlled it, Messrs. Stanford and Crocker being the principal gentlemen concerned.

232 Recross-examination.

By Mr. BOOTH:

57 X Ques. When did you say the Clay-street hill extension was opened for business?

Ans. I think it was in about from four to six months after I first saw the construction, in 1877. I have no accurate knowledge on that point.

58 X Ques. Will you state positively that it was open in the year 1877?

Ans. Let me look at my receipt and I can tell you then. (Refers to papers.) I feel very confident that it was open in 1877, but I have to trust to my memory, and I might be mistaken. Eleven years ago is a long time to remember.

59 X Ques. When did you say the California-street cable road was opened for business?

Ans. That seems to be 1878—in the early part.

60 X Ques. Was not the California-street cable road constructed by Mr. Root?

A. I always understood Mr. Root was the chief engineer, although there were others in the employ of the company that had much to do with its design.

61 X Ques. Was Mr. Root not connected with the California-street cable road after it was opened for business?

A. I cannot answer that from my own knowledge. My impression is that he was, because I have seen him about the works.

GEO. PARDY.

*Examination-in-Chief of Henry Root.*

HENRY ROOT, having been by me first cautioned and sworn to testify the whole truth before the commencement of his testimony, was carefully examined and his testimony reduced to writing by me, and he deposed as follows:

233 By Mr. DICKINSON:

1 Ques. Please state your name, age, residence, and occupation.

Ans. My name is Henry Root; my age, 41 years and upwards; residence, San Francisco, and occupation civil engineer.

2 Ques. Are you the complainant in this case?

Ans. Yes.

3 Ques. When was the invention embraced in the patent in suit first put into practical use under your direction, and what place?

Ans. During the year 1878, on California street, in this city.

4 Ques. Who paid for this construction?

Ans. By this construction I suppose you mean the California-street cable railroad. It was paid for by a corporation, of which Leland Stanford was president and by far the largest owner of the stock.

5 Ques. Do you mean that he owned a large majority of the whole stock?

Ans. He did at the time the road was open.

6 Ques. When was the road open for business?

Ans. I think it was during the month of April, 1878.

7 Ques. And it has been in regular business operation since that time, collecting fares from the public, has it?

Ans. It has, excepting some short periods, one of which was at the opening of an extension and the other a short time while some little changes were being made.

8 Ques. Were you a stockholder in the road yourself?

Ans. I was not a stockholder myself. I was doing the private and personal engineering work for Governor Stanford in this city at that time, and was also engineer of the Market-street road, a horse road at that time, in this city, of which Governor Stanford was also president, and assisting engineer on the local work of the Central Pacific railway.

234 9 Ques. What was the nature of the changes to which you have referred as causing a temporary suspension of operations in the California-street road?

Ans. During the year 1879 the road was extended from Fillmore street to Central avenue, about May, 1879, and I think there was a little delay at the opening of that extension previous to that time; there had been a little change in switches near Fillmore street, which, I think, caused the little delay; the cable had also been cut by accident a couple of times, which caused delays of half a day on

each occasion; but, except for these short delays, the road has been in continuous operation up to this time.

10 Ques. When was the extension commenced, and were the road-bed and tunnel of the same character of construction as in the original line?

Ans. I think that extension was commenced about February, 1879. The construction was on an entirely different plan from the principal part of the road, which was constructed during the years 1877 and 1878.

11 Ques. Please explain this difference in construction.

Ans. As constructed at that time only the rails and slot irons were of the same kind used in the original road. The yokes were made of framed sections of redwood, the bottom member being six inches square. These wood-frame sections were set crosswise every four feet and the space between them forming the walls of the tube or tunnel was made of 2-inch redwood plank; the surface or roadway was formed of three-inch Oregon pine resting on these wooden frames before mentioned. The space outside the planking was filled in with earth. No concrete whatever was used on this extension as constructed at that time.

12 Ques. Why was the construction changed in the extension?

235 Ans. It was changed to cheapen the first cost and to enable the company to pay for it out of the net earnings without assessing the capital stock.

13 Ques. It was not by reason of any defect, then, of the original construction?

Ans. At that time the original construction had not been in use a sufficient length of time to convince some of the owners that it was the most desirable method of construction.

14 Ques. What was the cost of the construction of the original part of the road apart from the driving plank, cable, and rolling stock? I mean the cost of the road-bed and tunnel.

Ans. I can only give you that approximately. I should say about $225,000.

15 Ques. What was the length of the original road-bed?

Ans. A fraction less than two miles of double track.

16 Ques. When did you first become aware of the issue of patent 193,757 to Wm. Eppelsheimer?

Ans. That I cannot tell.

17 Ques. Please tell as nearly as you can.

Ans. I have been trying, since you mentioned that question, to recollect, but am not able to do so.

18 Ques. Where was Eppelsheimer when you first became aware of the grant of this patent to him?

Ans. I don't know.

19 Ques. Was he in America?

Ans. I don't know that.

20 Ques. Have you any knowledge of a demand ever made by Eppelsheimer upon the California Street Railway Co. or any one connected therewith for any royalty or remuneration for the use of

his invention in the construction of the California-street road—the invention covered by said patent?

Ans. No such demand was ever made on me and I have no knowledge of its ever having been made on the California Street Railroad Co.

21 Ques. When did you first hear of such a demand? By rumor or otherwise?

236 Ans. I have no knowledge whatever of any such demand ever having been made that I can recollect.

22 Ques. Now, please state, to the best of your recollection, when you first heard either a rumor or intimation of any such demand.

Counsel for complainant objects to the above question, first, that it assumes that the witness has testified that he did hear of such a demand or rumor, and, second, that it is wholly immaterial as evidence what rumor the witness may have heard, he having positively stated that he had no knowledge of any such demand.

Ans. I have already said that I don't remember of ever having heard any rumor whatever as that question would imply.

23 Ques. When did you first become aware that Wm. Eppelsheimer claimed to have been the inventor of the manner of constructing the tube in the California-street railway?

Ans. I cannot remember.

24 Ques. I read you an extract from the San Francisco Evening Bulletin of December 12, 1877, and an extract from the above-named paper of Dec. 14, 1877, as follows:

"From the San Francisco Daily Evening Bulletin of December 12, 1877, second column, second page.

"*Justice to Whom Justice is Due.*

"EDITOR BULLETIN: I observe an article in the Bulletin of December 7th in praise of the California-street wire railroad. The article is just and proper in everything except as to the man who designed the road and its machinery. A young civil en-

237 gineer by the name of Henry Root wholly designed the road, invented the form of the rail, made the pattern, and ordered its construction, designed the form of the tube as well as the grip, designated the material, laid out the work, and superintended its construction in every particular; in short, had the entire control, direction, and supervision — the road and work from its incipiency to the present time.

"A publication of this will give honor where honor is due.

"ONE WHO KNOWS.

"San Francisco, Dec. 26, 1877."

"From the above-named paper, December 14, 1877, second column, second page.

"*Justice to Whom Justice is Due.*

"EDITOR BULLETIN: Please grant me a small space in your valuable paper to correct an error made by the pseudonymous, 'One who knows,' in the Bulletin of December 12th regarding the tube of California-street railroad. The design of the road, especially the tube and the manner of its construction, was my invention.

"I proposed it more than a year ago to several of the trustees of said road when they were contemplating the adoption of cast-iron tube. At their request I submitted my plans and drawings to the engineers of the Central Pacific Railroad Company.

"My application for a patent of the same was filed January 18, 1877, and letters patent obtained July 31, 1877.

"I take pleasure to acknowledge that the workmanship of the entire road owes great credit to the superintending engineer, H. Root.

"Yours very respectfully,

"WM. EPPELSHEIMER."

238 Please state if you have any knowledge of these publications.

Ans. I have no recollection whatever of ever having seen any such articles myself or of having heard of any at that time.

Counsel for defendant gives notice that he will offer in evidence certified copies from the public files of the San Francisco Evening Bulletin embracing the above extracts.

25 Ques. Please state if you know where Mr. Eppelsheimer was when you applied for the patent now in suit the 3d September, 1881.

Ans. I do not know.

26 Ques. Please state, if you know or as nearly as you can, how long the Clay-street hill extension cable road in this city has been in public use.

Ans. I think the Clay-street extension was put in operation about the fore part of January, 1878.

27 Ques. When did you first become aware of the construction of the road-bed and cable way on that road?

Ans. I became aware of it before it was commenced. Mr. Britton, the manager of that road and one of the principal owners, was also one of the incorporators of the California-street road. I was in consultation with Mr. Britton and also Mr. Wheeler, his engineer, on that work and know generally what was going on there.

28 Ques. You knew, then, at the time the road was put into actual use?

Ans. Yes; I knew at the time, but cannot fix the exact date now.

29 Ques. Now, Mr. Root, will you please inform us who paid for the model or sample section for the California-street cable railway, the

239 iron-work of which was constructed at the Hope iron works and which was completed by the application of concrete around the said iron-work to form the cable tube?

Ans. I think the rails which formed the ribs were taken from the Potrero and Bay View railroad, of which I was also engineer and Governor Stanford president, and no charge ever made for them. The bill of Mr. Hanscom for remainder of the iron-work, I think, was paid by Mr. Douty, of the construction department of the Central Pacific Railroad Company, and charged to me personally at the time, but it was subsequently refunded to me, either by the California Street Railroad Company or the Market Street Railroad Company. I cannot tell which. The concrete was furnished and put in by men working under me in the different departments of the Central Pacific railroad and no charge or account ever made of it.

30 Ques. Did you have from Governor Stanford or the company any authority or consent to have this model or specimen made, provided it would not cost more than so much?

Ans. Yes; I think I had that consent from Governor Stanford, but whether directly or indirectly I cannot tell.

HENRY ROOT.

It is agreed that an adjournment be now taken until ten o'clock a. m. Monday, November 14, 1887, at the same place, and that the witness, Henry Root, may be called for cross-examination at a future day.

240 Office of Geo. Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CALIFORNIA,
MONDAY, *November* 14, 1887.

Met pursuant to adjournment.

Present: Henry Root, the complainant; J. H. Dickinson (by consent), Mr. Booth being sick; and the witness, William H. Milliken, not appearing, adjournment was taken until Tuesday, Nov. 15, 1887, at 10 o'clock a. m., same place.

Office of Geo. Pardy, 402 Montgomery street.

SAN FRANCISCO, CALIFORNIA,
TUESDAY, *November* 15, 1887.

Met pursuant to adjournment.

Present: Henry Root, complainant; J. H. Dickinson (by consent), for defendant, and the witness, William Henry Milliken, who, having been by me first cautioned and sworn to testify the whole truth before the commencement of his testimony, was carefully examined, and his testimony reduced to writing by Beal, a disinterested person, and the said William Henry Milliken deposed and said as follows—that is to say:

Examination-in-chief of WILLIAM HENRY MILLIKEN.

(By Mr. DICKINSON:)

Q. 1. Please state your name, age, residence, and occupation.

A. My name is William Henry Milliken; my age is 52 years; my residence, San Francisco, and my occupation, mechanical engineer and contractor.

241 Complainant at this point enters his objection to the examination of this witness on the ground that his name is not mentioned in the notice, and notice is hereby given that a motion will be made to strike out the deposition of this witness on the said ground.

2 Q. Mr. Milliken, is there any other William Milliken in this city in your line of business?

A. No, sir; not in mechanical engineering and contracting.

3 Q. Are you well known to the complainant in this case, Mr. Henry Root?

A. Yes, sir.

4 Q. How long have you known Mr. Root?

A. I have known him for ten years.

5 Q. Have you had any connection with cable railroads; and, if so, in what capacity?

A. My first connection was with the California-street railroad. I was assistant to Mr. Root, the chief engineer of the road. My next connection was with the Presidio and Ferries railroad; I was chief engineer and superintendent. My next connection with the street railroads was chief engineer of the Telegraph Hill road, and have made plans for other parties in Los Angeles, Omaha, and so forth, and some for China.

6 Q. Are you not the inventor of several cable-railroad appliances?

A. Yes, sir.

7 Q. When was the California-street railroad in this city first put into operation?

A. To the best of my recollection it was about the 1st of March, 1878; that is when they commenced to do business; the first starting was in December previous.

8 Q. You are fully acquainted with the construction of the road, then?

A. Yes, sir.

9 Q. I now show you Defendant's Exhibit C, which is a
242 transverse sectional view of said road-bed. Do you recognize it as a fair representation of the structure as far as it goes?

A. Yes, sir; it is a very fair representation of it.

10 Q. Have you any experience or knowledge of the use of concrete in roadways, especially in road-beds of railroads?

A. Yes, sir; I have had some experience in it.

11 Q. From your knowledge and experience, would you think it was necessary to make a prolonged experiment with the form of construction as illustrated by Exhibit C to demonstrate its practical value, the said construction consisting of a concrete body with iron ribs imbedded therein, and please give your reasons for any opinion you may express?

A. I don't see any reason from my knowledge of concrete why there should be any experiment at all. It is a known fact that concrete is no experiment any more than the laying of a foundation in brick and cement. In fact, it has been considered by engineers for 10 or 12 years to be superior to brick-work.

12 Q. What is the effect of age upon concrete foundations of the character illustrated in the California-street tube?

A. The effect of age is to harden it or increase its strength.

13 Q. Then if this structure had been long in the ground, say from six months to a year, and during that time had shown no signs of disintegration or deterioration, would you, as an engineer, be perfectly satisfied as to its practical success for the purposes intended without requiring any longer time?

A. I should, in my opinion, consider it a perfect success, for the reason that concrete increases in hardness and strength from the time it is first laid up to about seven years; it is generally considered that it requires about seven years to get the full set of the cement or full strength.

243 14 Q. Will you please state what is the general character as to grades of the California-street line?

A. The general character is very steep grades.

15 Q. Are they so steep as to preclude general traffic; does not the grass grow on some of the blocks?

A. Yes.

16 Q. Then there is no heavy teaming over that line?

A. Oh, yes, sir; some heavy teaming across the line—at the crossing of Polk street, for instance.

17 Q. Do you know what the construction of the tube of the Clay-street extension is like?

A. I saw it at the time it was being constructed; was there several times looking it over.

19 Q. Please give a short description as you remember it.

A. The yokes or ties of the extension of Clay street were made of cast iron, and the tube, bottom, and sides are made of concrete, and top is closed over with wood, one end resting on channel bars and the over end resting on the side of the concrete tube.

20 Q. Do you recognize Exhibit B?

A. Yes, sir. I recognize it as a cross-section of the extension of the Clay-street road.

21 Q. When, if you remember, was this Clay-street extension road put into operation?

A. I couldn't say just when it was; it was somewhere about the holidays, about Christmas, in 1877.

22 Q. Mr. Milliken, do you remember a short section or model of the California-street tube construction being made and exhibited on Fourth and Townsend streets, in the yard of the railroad company, prior to the actual construction of the California-street road?

A. I don't know anything about the manufacturing of the model, but I saw a model there in the yard, and my attention was

244 called to it by Mr. Root as being a plan of the construction of the California-street road.

23 Q. Do you know who was the designer of that model?

A. I don't know of my own knowledge who was the designer, but I was told.

24 Q. Will you be kind enough to state who told you in regard to that matter and what was said?

A. Mr. Root told me that it was Mr. William Eppelsheimer's design.

25 Q. I hand witness Exhibit C and ask him if it fairly represents the construction of that model, as you remember it at this time?

A. Well, it is a very fair representation as I remember it, with the exception that the concrete was flat on the bottom and straight on the sides.

26 Q. Have you any idea, Mr. Milliken, as to the cost of the California-street structure, eliminating the cable, engine-house plant, and rolling stock—that part ending where the concrete tube ends, or ending at Fillmore street?

A. At the time of the building of the road I did not go into any detailed figures of the cost of the material or the labor of the construction.

27 Q. Will you give us a fair estimate of the cost, as near as you can?

A. I can give you what the common report was. That is that it cost $62,000 per mile of single track. The road is about two miles long of double track or four miles of single track, making a total cost of about $248,000.

28 Q. Did you have any conversation at any time during the construction of the California-street road with Mr. Root in reference to the building of the Market-street line upon the same general plan of the California-street, as far as the road-bed is concerned? If so, please give the substance of that conversation.

A. I had several conversations with him in regard to that subject of building the Market-street road, but could not say when
245 or where or exactly what the conversation was, but he gave me to understand that he anticipated going on with the Market-street road as soon as he got through with the California-street.

29 Q. The Market-street road was subsequently built, was it not?

A. Yes, sir.

30 Q. Is the Market-street road with its branches a more or less extensive work than the California-street road?

A. It is a great deal more extensive.

31 Q. Is the tube or tunnel built upon the same general plan, as far as being a structure, with wrought-iron ribs or yokes imbedded in concrete?

A. Yes, sir; it is.

32 Q. How long, in your judgment, was required to demonstrate the success of the California-street tube and road-bed?

A. In my judgment I should say one year was sufficient.

33 Q. As a matter of fact has it operated with unimpaired success since it was put in use?

A. I consider it one of the most successful roads in the city.

Cross-examination by Mr. BOOTH:

31 X Q. In speaking of the California-street road you say "where the concrete tube ends, at Fillmore street." Does the concrete tube end there now?

A. It did end there, but it has been extended with a wooden structure which has rotted out and has been replaced by a concrete structure, about the year 1885, of the same general nature of the first section as spoken of before.

35 X Q. What is the common name for those metal sections that form the frame-work of a cable road?

A. Yokes is the common name, I think.

246 36 X Q. Are there any other common names that you think of used?

A. Well, some call them ribs.

37 X Q. Do you think of any other common term for the same thing?

A. It is very seldom that any one calls them ties.

38 X Q. About when was the actual work commenced in the construction of the California-street cable road?

A. The actual work commenced in the street of constructing roadway was about the 1st of August, 1877.

39 X Q. About when was the work closed up on the street, approximately?

A. About the 1st of January, 1878.

40 X Q. The model section you speak of as having seen in the yard of the railroad company at Fourth and Townsend street—was that or any portion of it used in the construction of the California-street road?

A. I could not say as it was.

41 X Q. Can you say positively that it was not? I refer to the thing itself.

A. It was not used. I think the road was nearly all built or well under construction when I saw the model.

42 X Q. Do you know that this model section just spoken of was ever in the possession of the California Street Railroad Company at all?

A. No, sir; I do not. The yard I speak of in which I saw the model is the Central Pacific Railroad Company's yard.

43 X Q. Where did your experience with street-railroading begin?

A. In San Francisco, with the California-street road.

44 X Q. Did you ever see any cable road or do you know of any cable road anywhere having been constructed of iron yokes or ribs, on the general plan of the California-street road, before the

247 commencement of that road, the said yokes or ribs being imbedded in concrete?

A. No, sir.

45 X Q. Then, so far as you know, that is the first road commenced and constructed in that way?

A. Yes, sir.

46 X Q. You speak of being told about the design of the model section you saw in the Central Pacific railroad yard. Can you tell when you were so told?

A. Not exactly; only that it was during the construction of the California-street railroad. It may have been a little later in the spring when the railroad was completed.

47 X Q. Do you remember when you saw this model section the last time?

A. No, sir; I do not.

At this point adjournment was taken until Wednesday, November 16, 1887, at 10 o'clock a. m., at the same place.

Office of Geo. Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., WEDNESDAY, *November* 16, 1887.

Met pursuant to adjournment.

Present: Henry Root, complainant; J. H. Dickinson, by consent, and the witness, William Henry Milliken, whose cross-examination was continued, and who said as follows—that is to say:

By Mr. BOOTH:

48 X Q. You have spoken of the Market-street road, in this city, having been subsequently constructed on the same general
248 plan as the California-street; can you tell when the work of the actual construction on the street of that road was commenced, and who was the president, and also who was the engineer and superintendent of construction?

A. I cannot tell who was the president, but the secretary was Mr. J. L. Willicut and the superintending engineer was Mr. Henry Root.

49 X Q. How much more extensive an undertaking was the construction of the Market-street system constructed at that time than the California-street road, constructed during the years 1877 and 1878—I mean the relative expenditure required approximately?

A. Approximately I should say the Market-street system cost six times as much as the California-street—from six to eight times.

50 X Q. Who was the owner of the Clay-street hill railroad at the time the extension was constructed, and also who was the constructing engineer?

A. The owners, to the best of my knowledge, were A. S. Hallidie, Henry L. Davis, Joseph Britton, and James Moffitt, and Samuel H. Wheeler was the superintending engineer.

51 X Q. Did William Eppelsheimer have anything to do with the said Clay-street hill extension—I mean that part constructed during 1877 and 1878?

A. I saw him around there several times, but was not aware that he had anything to do with the construction of the extension.

52 X Q. When did you see him around there and at what place?

A. I saw him at the engine-house and I saw him at the terminus

at Clay and Kearney streets during the time that the construction was going on.

53 X Q. Do you or do you not believe, as a matter of fact, that said Eppelsheimer was not connected with the Clay Street Hill Company at that time?

249 A. He may have been a stockholder in the company, but I don't believe he was employed at all by the company.

54 X Q. Have you any reason for believing that he was a stockholder in the company at that time; and, if so, what is that reason?

A. The reason is this: I know he was a stockholder in the Geary-street road when he was constructing engineer of that road, and previous to the construction of the Clay-street extension he was the engineer of that road.

55 X Q. How long previous?

A. I could not say how long. Another reason is that when I was engineer of the Telegraph-hill road I was asked to take stock therein as part compensation for my services, and it is quite probable that Mr. Eppelsheimer was asked to do the same thing when he was the superintending engineer of the Clay-street road.

56 X Q. How do you know that William Eppelsheimer was ever engineer of the Clay-street road at any time?

A. I was informed by Mr. Hallidie, the president of the road.

57 X Q. When did he so inform you?

A. At the time I was superintending the constructing the Presidio and Ferries road, between June, 1880, and February, 1882.

58 X Q. What did Mr. Hallidie say to you in regard to it?

A. I don't remember the exact words, but he spoke of some things that had been done on the Clay-street road under Mr. Eppelsheimer when he was the engineer.

59 X Q. Did he tell you that Mr. Eppelsheimer had anything whatever to do with the Clay-street hill road in any capacity whatever subsequent to the year 1874—three years prior to the construction of the extension spoken of?

250 A. No, sir; he didn't mention at what time Mr. Eppelsheimer was in their employ. He merely spoke of his being in their employ.

60 X Q. Do you know whether the relations of Hallidie, Davis, Britton, and Moffitt were of a friendly nature in 1877 and 1878?

A. I do not. I know that they were directors and officers of the road.

61 X Q. Don't you know, as a matter of fact, that from your conversation with them or some of them that they—Hallidie, Davis, Britton, and Moffitt—were unfriendly towards William Eppelsheimer at that time?

A. I should judge that they were by some things that were said, though I cannot state anything positive that was said; but I had that impression from what they said.

62 X Q. Please state again your different employments since the construction of the California-street road.

A. I was first connected with the Sutter-street road to furnish plans and specifications for setting additional machinery at the

corner of Bush and Larkin streets; next I was employed by the Presidio and Ferries road; next I was employed by the City railroad to make plans for constructing cable road on Mission street; next was employed by the Telegraph-hill road; since then I have been employed to make plans for a road in Omaha and for one in Los Angeles, and also sent copies of those same plans to China; was also employed to put in some short pieces of cable for the Omnibus Railroad Company. That was during the time that I was partially employed by the Telegraph-hill road. In connection with the City railroad, Mr. Woodward, president thereof, asked me to make a report in regard to the practicability of Pardy's low-pressure compressed-air system, which I did.

63 X Q. The Mr. Pardy mentioned was a witness in this case, was he not?

A. Yes, sir.

251 64 X Q. Do you mean to be understood, and is it the fact, that all the opinions in your testimony are based upon knowledge of facts that have been developed by actual experience, said experience extending through nearly the whole of the ten years last past, and not from any theory or from information derived from books alone?

A. My testimony is based on information from books, confirmed by my practical experience; very little of it is from books, especially on cable railroads.

WILLIAM H. MILLIKEN.

Defendant here offers in evidence a pamphlet which is admitted to be a true copy of an argument filed in the United States Patent Office by George Pardy, attorney for Wm. Eppelsheimer, in the motion for reopening of the interference between the application of Henry Root, filed Sept. 3, 1881, and the patent of Wm. Eppelsheimer, No. 193,757, which for identification is marked Defendant's Exhibit E.

Defendant's counsel states that this Exhibit E is introduced to show the history of this interference and the circumstances under which the patent in suit was granted to Henry Root.

Counsel for defendant instructs the notary taking this deposition to copy from the public files of the "San Francisco Daily Evening Bulletin" the extracts referred to in the testimony of Henry Root and entitled "Justice to whom justice is due" and to certify the same as correct extracts from the files of the "Daily Evening

252 Bulletin" of December 12, 1877, and December 14, 1877, respectively, and to mark the same for identification Defendant's Exhibit D.

HENRY ROOT called for cross-examination.

By Mr. BOOTH:

31 X Ques. You have been asked whether William Eppelsheimer ever made any demand on the California Street Railroad Company for compensation for the use of any invention claimed by him. I

will now ask you if you ever told any person, at any time during the construction of the California-street cable railroad or at any other time, that the invention or design of said Root or any part thereof or the design or invention of any model section previously constructed and similar to said road was the design or invention of said Eppelsheimer.

Counsel for defendant objects to the question as not proper cross-examination, the question asked being based upon testimony given, which is entirely irrelevant to the subject of the present question.

A. I never told anybody any such thing.

32 X Q. You have also been asked whether you heard rumors in regard to Eppelsheimer's laying claim to the invention or design of the California-street railroad. Did you ever talk with anybody upon that subject; and, if so, did you tell them that said design or invention was Eppelsheimer's?

Counsel for defendant objects to the question upon the same grounds as to the previous question.

253 A. I may have talked with different people upon that subject, but I am positive and know that I never told anybody that either the invention or design was Eppelsheimer's.

For the reasons given, counsel for defendant gives notice that he will move to strike the above two questions and answers from the record as not proper cross-examination, the same being, in effect, direct testimony on behalf of complainant and admissible only as such.

HENRY ROOT.

At this point adjournment was taken until Thursday, Nov. 17, 1887, at 10 a. m., at the same place.

Office of George Pardy, No. 402 Montgomery street.

SAN FRANCISCO, CAL., THURSDAY, *November* 17, 1887.

Met pursuant to adjournment.

Present: For defendant, J. H. Dickinson (by consent); Mr. Root not present.

The notary taking this deposition states that since the hour of adjournment yesterday he proceeded to examine the files of the "Daily Evening Bulletin" under date of December 12th, 1877, and December 14, 1877, and finds as follows, viz:

Under date of December 12, 1877, an article in said paper on second page thereof headed as follows:

"*Justice to Whom Justice is Due.*

254 "EDITOR BULLETIN: I observe an article in the Bulletin of December 7th in praise of the California-street wire railroad.

"The article is just and proper in everything except as to the

man who designed the road and its machinery. A young civil engineer by the name of Henry Root wholly designed the road, invented the form of the rail, made the pattern and ordered its construction, designed the form of the tube as well as the grip, designated the material, laid out the work, and superintended its construction in every particualr; in short, had the entire control, direction, and supervision of the road and work from its incipiency to the present time. A publication of this will give honor where honor is due.

"ONE WHO KNOWS.

"San Francisco, December 8, 1877."

"And under date of December 14, 1877, an article in said paper on second page thereof entitled—

"*Justice to Whom Justice is Due.*

"EDITOR BULLETIN: Please grant me a small space in your valuable paper to correct an error made by the pseudonymous One Who Knows in the Bulletin of December 12th, regarding the tube of California-street railroad. The design of the road, especially the tube and the manner of its construction, was my invention. I proposed it more than a year ago to several of the trustees of said road when they were contemplating the adoption of a cast-iron tube.

"At their request I submitted my plans and drawings to the engineers of the Central Pacific Railroad Company.

"My application for a patent of the same was filed January 18, 1877, and letters patent obtained July 31, 1877.

255 "I take pleasure to acknowledge that the workmanship of the entire road owes great credit to the superintending engineer, H. Root.

"Yours very respectfully,

"WM. EPPELSHEIMER,

*Constructing Engineer of the Clay Street Hill Railroad from Kearney to Leavenworth Street.*

Which he certifies to be a true copy of said articles and Defendant's "Exhibit D."

Testimony closed under this notice.

HOLLAND SMITH,
*Notary Public.*

STATE OF CALIFORNIA,
*City and County of San Francisco,* } ss:

I, Holland Smith, a notary public within and for the city and county of San Francisco, State of California, do hereby certify that the foregoing depositions of George Pardy, William Wallace Hanscom, Henry Root, and William Henry Milliken were taken before me on behalf of The Third Avenue Railroad Company, the defendant in a civil cause in the circuit court of the United States for the southern district of New York, held at New York, in said district, on the equity side of said court, wherein Henry Root is complainant and The Third Avenue Railroad Company is respondent, in an action

for infringement of patent; that said depositions were taken in pursuance of the notices hereto annexed; that the reason for taking said depositions was and is and the fact was and is that each of said deponents lives at a greater distance from New York, the place of trial of the said civil cause, than one hundred (100) miles, to wit, in the city and county of San Francisco, State of California; that said depositions were taken at the
256 office of Geo. Pardy, at No. 402 Montgomery street, in the said city and county of San Francisco, on the twenty-seventh day of September, A. D. one thousand eight hundred and eighty-seven, and pursuant to adjournment on the twenty-eighth, twenty-ninth, and thirtieth of September; October first, third, fourth, fifth, sixth, seventh, eighth, tenth, eleventh, twelfth, thirteenth, fourteenth, fifteenth, seventeenth, eighteenth, nineteenth, twentieth, twenty-first, twenty-second, twenty-fourth, twenty-fifth, twenty-sixth, twenty-seventh, twenty-eighth, twenty-ninth, and thirty-first, and November first, second, third, fourth, fifth, seventh, eighth, ninth, tenth, eleven, twelfth, fourteenth, fifteenth, sixteenth, and seventeenth; that each of said deponents was by me duly cautioned and sworn to testify the whole truth before the commencement of his testimony, and each was carefully examined; that the testimony of George Pardy, William W. Hanscom, and Henry Root, and each of them, was then and there reduced to writing by me and by no other person, and the testimony of William Henry Milliken was reduced to writing then and there by Jno. O. Beal, a disinterested person, by consent of the complainant and counsel for defendants and by no other person, and that each of said witnesses subscribed his testimony after it had been so reduced to writing; that the complainant, to wit, Henry Root, was represented by William F. Booth, Esq., of counsel, and the respondent, to wit, The Third Avenue Railroad Company, was represented by J. H. Dickinson, Esq., by consent; that said testimony was commenced at eleven o'clock a. m. on twenty-seventh day of September, A. D. 1887, and was continued pursuant to adjournment on the twenty-eighth, twenty-ninth, and thirtieth days of said month; on the first, third, fourth, fifth, sixth, seventh, eighth, tenth, eleventh, twelfth, thirteenth, fourteenth, fifteenth, seventeenth, eighteenth, nineteenth, twentieth, twenty-first, twenty-second, twenty-
257 fourth, twenty-fifth, twenty-sixth, twenty-seventh, twenty-eighth, twenty-ninth, and thirty-first days of October, and the first, second, third, fourth, fifth, seventh, eighth, ninth, tenth, eleventh, twelfth, fourteenth, fifteenth, sixteenth, and seventeenth days of November, 1887, and was concluded on the said seventeenth day of November, 1887; that it being impracticable for me to deliver said depositions with my own hand into the court for which they were taken, I have retained the same for the purpose of being sealed up by me and speedily and safely transmitted by the United States mail to said court for which they were taken and to remain under my seal until there opened; that I am not, nor is the said Jno. O. Beale, of counsel or attorney to either of the parties, nor interested in the event of the cause; that the fees for taking said depositions

amount to $130, and that the same is just and reasonable for the services performed and has been paid me by said respondent.

In testimony whereof I have hereunto set my hand and affixed my seal of office, at the city and county of San Francisco, [L. S.] California, this seventeenth day of November, A. D. one thousand eight hundred and eighty-seven.

HOLLAND SMITH,
*Notary Public of the State of California in and for the City and County of San Francisco.*

258 United States Circuit Court, Southern District of New York.

HENRY ROOT, Complainant,
*vs.*
THIRD AVENUE RAILROAD COMPANY. } In Equity. No. 3866.

Testimony taken on the part of the defendant, under and pursuant to the 67th rule of the Supreme Court of the United States, as amended, before John A. Shields, Esq., a standing examiner of said court.

NEW YORK, *November 29th*, 1887.

Present: George J. Harding, Esq., of counsel for complainant, and Frank A. Hopkins, Esq., of counsel for defendant.

OCTAVIUS KNIGHT, Esq., a witness produced on the part of the defendant, being duly sworn, testifies as follows:

Q. 1. Please state your name, age, residence, and occupation.

A. Octavius Knight; age, 57 years; residence, Washington, in the District of Columbia; occupation, solicitor and expert in patent cases.

Q. 2. What experience have you had tending to qualify you to testify as an expert in patent causes?

A. My entire business occupation for the past thirty-one years has consisted in the preparation and prosecution of applications for letters patent, making investigations in the United States
259 Patent Office and elsewhere to ascertain the novelty of inventions, machinery, and structures of various kinds and their relations to existing patents. I have been constantly called on in the prosecution of my business as aforesaid to critically examine and compare mechanical structures, to determine differences and similarities between them, and I have frequently been called on to testify as an expert in patent causes, more especially during the last ten or twelve years.

Counsel for complainant is advised that the time for taking evidence on behalf of the respondent in the above suit and in another between the same parties, No. 3867, expires November 30th, 1887. He here states that if testimony be taken from day to day in the suits mentioned in this statement until said evidence is concluded, then counsel for complainant will waive any objection to the evidence on account of its being taken after the expiration of the time

set by the court. Counsel for complainant agrees that counsel for respondent may conclude the direct evidence in suit No. 3867 before further proceeding with the direct evidence in suit No. 3866, it being understood that the cross-examination of any witnesses called on or after November 29th in either suit is to be reserved, if desired by counsel for complainant, until a time convenient to himself.

Adjourned to Saturday, December 3, 1887, at 10 a. m.

260 NEW YORK, *December 3d*, 1887—10 o'clock a. m.

Met pursuant to adjournment.

Present: George J. Harding, Esq., of counsel for complainant, and Herbert Knight, Esq., of counsel for defendant.

Q. 3. Have you read and do you understand letters patent No. 262,126, granted August 1st, 1882, to Henry Root for an alleged improvement in the construction of cable railways? If yes, please explain the nature of the invention shown and described in said letters patent and particularly pointed out in the 1st, 2d, 3d, 6th, and 7th claims thereof.

A. The patent of Mr. Henry Root, No. 262,126, referred to in the question, relates to cable railways.

The second sentence in the specification, which comprises what is commonly known as the statement of invention, is in the following words:

"My invention relates to cable railways; and it consists in the employment of a connecting tie for the rails and supports for the slot irons, by which both are rigidly supported from the ties and united to each other."

This is a broad statement of the alleged novelty or supposed novelty in the invention of the patentee. The specification proceeds to state as follows:

"In combination with this construction I employ a substratum of concrete or equivalent material, which will set or solidify and unite the whole into a continuous rigid structure, no part of which is liable to be displaced from its relation to the other and also provide a support for the roadway."

"A substratum of concrete or equivalent material" is thus referred to as an incident in the invention or improvement which the
261 patentee supposed to be new or a preferred mode or adjunct used in carrying the invention into effect, but to show that the invention was supposed to consist broadly "in the employment of a connecting tie for the rails and support for the slot irons," so that both the rails and slot irons "are rigidly supported from the tie and united to each other."

The patentee, after referring to the use of "a substratum of concrete or equivalent material," proceeds to describe and define the supposed prior state of the art in the following language:

"Previous to my invention all cable railways had been constructed of iron ribs of the form of the tube, set at suitable intervals, to which the slot iron or timber, as the case may be, was bolted, and the spaces between these ribs filled with wood to form a contin-

uous tube. Outside and independent of this tube the rails were laid, supported on short ties or other foundations, and were connected horizontally with the iron ribs by short bolts or rods, but were liable to settle by the undermining of their foundation without regard to the tube or the other rail of the track. This would frequently occur by the renewal of the paving outside of the track, the introduction of house connections with the main sewer, or other disturbances of the street. This settling would cause great inconvenience, as the gripping apparatus, which is carried by the rails through the medium of the car or dummy, must travel in a fixed position in the tube, thus making a frequent adjustment of the rails to the tube necessary. The space between the rails and sides of the tube was filled with sand, which could not be securely confined, as the joints in the tube were liable to open by settling so as to require a frequent relaying of the paving or planking and making the whole insecure and expensive to maintain. In my invention the whole forms a single rigid structure."

Adjourned to Tuesday, December 6th, 1887, at ten a. m.

262 NEW YORK, *December* 6, 1887—10 o'clock a. m.

Met pursuant to adjournment.

Present: Counsel as before.

OCTAVIUS KNIGHT, Esq., continues his answer to question 3 as follows:

The specification then goes on to describe the construction of "the connecting tie for the rails," and states that it is "bent so as to embrace the tube," and "has fastened to the ends suitably formed plates or chairs, B, to which the rails G are fastened," or stringers may be interposed between the rails and chairs. It then states that the ties may be conveniently formed of old T railroad rails, but the invention is not restricted to the use of bars of this particular shape. The other portions of the tie consist of "upright supports for the slot irons, having one end secured to the tie at points each side of the bend, sufficiently separated to form the necessary width for the tube," "and tie-rods connecting said supports with the main ties or frames through the rails, chairs, or stringers, as the case may be."

The specification and drawing thus describe and show in a clear and lucid manner an effective construction of wrought-iron tie serving to connect the track rails, support the slot irons, and unite these to each other so as to prevent the relative settling of the rails and slot irons, which, as stated by the patentee, was a frequent occurrence with previous constructions.

The specification then proceeds to describe a mass or body of "concrete in which the ties or frames are bedded at suitable distances to support the rails and slot irons which form the top of the tube," and states further that "this concrete forms a support for the iron-

263 work, the bottom and sides of the tube, and a foundation for the paving F, which fills the space between the rails and slot irons, thus forming an even and durable roadway which can-

not settle below the level of the rails or slot irons or cause side pressure on the tube, as is the case where the roadway is supported on sand or other independent foundation. As nearly all the weight of the traffic is on the rails, the tendency of the rails to go down is resisted by a deep girder, of which the bent tie forms the top, and this continuous mass of concrete forms the bottom."

The specification then proceeds to disclaim novelty in the use of "concrete as a material for foundations, underground sewers, and conduits," and states further that the invention claimed would not exist in the use of "concrete, brick-work, or iron stove-pipe" "to form the tube between the iron ribs of the well-known construction," for the reason that "these materials are as well known as wood; but it would be still subjected to all the danger of unequal settlement, and the short tie and stringer of wood require frequent renewal and adjustment to the level of the tube.

"It will be seen that a distinguishing feature of my invention is the connecting of the rails in the same structure as the slot irons and the tube, so that all the parts are maintained in their relative position, and whatever may occur to alter the place of one will have no effect, unless the change is sufficient to affect the whole structure."

It will be seen from the above quotation that the patentee in disclaiming novelty in the use of concrete for forming underground sewers and conduits, either with or without the addition of iron rails, states that such structures as he intended to disclaim would be subjected to the disadvantage of the unequal sett-ing of the rails because of the use "of short ties," which means ties interrupted by the tube or conduit, and not extending from one track rail to the other, so as to form a direct connection and band between them.

264 The patentee thus reverts to his original statement that his invention "consists in the employment of a connecting tie for the rails and supports for the slot irons by which both are rigidly supported from the tie and united to each other."

Coming to the claims, however, it is found that the patentee does not allege novelty in these connecting ties themselves, except when the same are formed of bent bars, as specified in claim 5.

The first and second claim-refer to the combination with the track-supporting or rail-connecting ties of a body of concrete forming a "foundation," which by reference to the specification is found to mean a foundation for the paving or roadway in contradistinction to having the pavement or roadway set and "supported on sand or other independent foundation," which, as the patentee explains, is liable to permit the pavement to "settle below the level of the rails or slot irons or cause a side pressure on the tube."

The first claim thus sets forth and embraces "in a cable railway, the tie connecting the rails and the upright supports for the slot irons, in combination with a concrete foundation" for the road-bed.

The second claim omits all reference to the supports for the slot irons, designates the ties by the reference letter A, and refers to their function of supporting the track, but, like the first claim, is limited

to the combination with the track-supporting ties of the concrete foundation for the road-bed.

The third claim is to "the combination of the rails G, ties A, and the tube formed of concrete or equivalent material, substantially as herein described." This will be seen to omit any specific allusion to the function or use of the concrete to form a foundation for the road-bed. Unless this be held as implied by the reference to the body of the specification or "the ties A" be understood to
265 refer to the particular form or construction of ties described in the specification, the intention of the third claim would seem to be to cover broadly the combination with the track rails of ties connecting said rails and a tube of concrete or equivalent material within or above the said ties.

The fourth and fifth claims are not embraced in the question, presumably because they are not included in the present controversy.

The sixth claim is in the following words: "6. The combined rails, slot irons, and connections, supported by a masonry foundation built to form the tube or a part thereof, substantially as set forth."

I can discover no foundation for this particular claim in the specification. The specification nowhere describes brick-work or masonry as a part of the invention of the patentee; neither is it the equivalent of concrete in respect to the function of concrete adapting it to set and solidify into a harmoneous structure after having been applied in a plastic state. The only allusion to masonry which I find in the specification is on the disclaimer, where the patentee states that it would not constitute invention or, as he expresses it, would not involve "any particular invention" to build up a tube of brick-work "between the iron ribs of the well-known construction" It is scarcely conceivable that the patentee intended to imply that, while invention would not be involved in building tubes of brick-work in sections from rib to rib, it would be involved in uniting these sections by a band or connection through the open ribs. The context shows, in my opinion, that the distinguishing feature referred to by the patentee to separate his invention from that which he intended to disclaim is the construction of the track-supporting ties themselves, which prevent an unequal settling of the rails.

If the "masonry foundation" alluded to in the sixth claim
266 is held to be an equivalent of concrete for the purposes of this invention, then the claim would be substantially the same as the first. If, however, the masonry *he* referred to as distinct and different from the concrete, then the said claim secures to cover a distinct invention and is, moreover, without foundation in the specification, as already stated.

The only representation of masonry in the drawing is the support for one of the cable-carrying sheaves, which sheaves are in practice applied 30 feet apart, more or less, in the bottom of the tunnel. The masonry or brick-work shown in the drawing for this purpose is not described or referred to in the specification, and it does not consti-

tute "a masonry foundation built to form the tube or part thereof," as set forth in the sixth claim.

The seventh claim is in the following words: "7. In a tramway track for wire-rope railroads, a tube to receive the rope or cable, made of concrete or equivalent material, open at the top and combined with iron ribs, substantially as set forth."

This claim must depend for its construction upon the prior state of the art. The features or elements combined in the claim are three—first, the tramway track; second, a tube to receive the cable for drawing cars on said track; third, iron ribs, which in the complete form or embodiment of the invention shown and described in the specification partially surround the tube, form a band between the track rails, and by means of supports and tie-rods between the track rails and the slot irons as well, so as to prevent any unequal settling between these parts. It is a specified condition in the claim that the tube is made of concrete or equivalent material; it is also specified that it is open at top, which is necessary in order to adapt it to operate in the manner described in drawing cars. As shown and described, the concrete of which the tube is formed com-
267 pletely envelops the ties and forms the direct foundation of the road surface and constitutes a continuous surrounding mass, enveloping the metallic supports of the tramway and slot irons.

As before stated, the language of the claim does not necessitate its limitation to all the conditions specified above, unless such limitation should be found necessary to save the claim from anticipation.

Adjourned to Wednesday, December 7, 1887, at ten a. m.

NEW YORK, *December 7th*, 1887—10 a. m.

Met pursuant to adjournment.

Present: Counsel as before.

Q. 4. State any knowledge you may have of the prior art tending to throw light upon the novelty of the alleged invention shown and described in the said patent No. 262,126.

A. In letters patent 193,757, granted to William Eppelsheimer, also of San Francisco, Cal., the 31st of July, 1877, five years before the date of Root's patent and more than four years before Root's application was filed, is shown, described, and claimed the entire invention claimed in the patent in suit excepting the fourth claim thereof, which is not now in controversy. Eppelsheimer does not show the concrete extending up quite so far, so as to constitute the bed on which the street pavement is directly laid, but he does show the concrete forming a complete and effective foundation for the roadbed and so as to prevent any lateral pressure of sand or other mobile foundation tending to collapse the tube which Root explains as being avoided in his construction. The vertical section, Fig. 1, in the
268 Eppelsheimer drawing is somewhat confused by the representation of two modes of construction in one figure. The left-hand side of the drawing shows the rail-connecting tie consisting of a bent bar, as specified in the fifth claim of Root's patent in suit, lettered A in the Root patent and C in the Eppelsheimer patent.

These bent bars are intended by Eppelsheimer to support and connect the rails as claimed by Root and are so shown by Eppelsheimer in his plan view Fig. 3. Eppelsheimer also shows connected with these the upright supports for the slot irons and the concrete foundation, thus fully anticipating or embodying the improvements set forth in the first claim of Root's patent in suit. Eppelsheimer also shows and describes in a cable railway the track-supporting ties in combination with the concrete foundation, being the improvement set forth in the second claim of Root's patent in suit. Eppelsheimer also shows and describes the combination of the rails, ties, and the tube formed of concrete, being the improvement set forth in the third claim of Root's patent in suit. Eppelsheimer also shows and describes and claims expressly "in a tramway track for wire-rope railroads, a tube to receive the rope or cable, made of concrete or equivalent material, open at the top and combined with iron ribs," this being the first claim in Eppelsheimer's patent and the seventh in Root's, the patent in suit. It will thus be seen that every claim in the Root patent in suit was fully and particularly anticipated in the Eppelsheimer patent of five years older date, unless it be the fourth claim in respect to the extension of the concrete to such a degree in breadth and height as to constitute a "surrounding mass" as specified in the fourth claim of the patent in suit; but the use of concrete for forming the tube for the cable and foundation for the road-bed being fully disclosed and claimed by Eppelsheimer, it was certainly within the knowledge and reach of the engineer to extend it to a greater or less breadth and height.

269 The application of Mr. Root for the patent now in suit was filed the 3d day of September, 1881, upwards of three years after the issue of the patent to Eppelsheimer disclosing precisely the same invention. It is found from an examination of the records of these two applications, as well as from the testimony already taken in the present case, that Mr. Root and Mr. Eppelsheimer were both in San Francisco in 1877, when Mr. Eppelsheimer's patent was taken out; that they were in conference in regard to this mode of constructing road-beds and cableways for street railroads, the drawings for which were made by Mr. Eppelsheimer; that subsequently, Mr. Eppelsheimer having gone abroad, Mr. Root applied for a patent for the same invention four years later, and demanded an interference with Eppelsheimer's patent; that Eppelsheimer failed to receive notice of the interference owing to his absence from the country; that the interference was decided in Root's favor upon what were in effect *ex parte* proceedings, and that when Mr. Eppelsheimer heard of the grant of the patent to Mr. Root for the invention previously patented to him he applied for a rehearing before the Commissioner of Patents on the ground that he had had no opportunity to be heard or to establish his claim as the true inventor; but this motion was refused by the Commissioner upon the ground that, both the patents being actually issued, the Commissioner having no power to annul a patent, there was

then no case before him upon which he could give relief or take any effective action.

In the testimony on behalf of Root in the interference case it is stated that he conceived the invention in September, 1876, and in December of the same year a full-sized model illustrating the principle was made; that a road for the practical application of the invention was commenced in 1877, completed in February, 1878, and put into practical operation in the month of April,
270 1878. From the testimony in the present case it appears that the road was the California-street cable railway, in the city of San Francisco, and that the said cable railway has been in constant successful operation and in use by the public ever since it was opened in April, 1878, which was three years and about five months before the filing of the application for the patent in suit. From the testimony heretofore taken in this case, and by my own inspection of the said California-street cable railway, which I made several times during the last month, November, 1887, I find that the said road embodies the subject-matter of the first, second, third, fourth, fifth, and seventh claims of the patent in suit, and in parts of the structure the sixth claim also.

I further find from an examination of the Patent Office records that certain of the features employed in the construction and operation of the California-street cable railway of San Francisco were shown and described and some of them claimed in other patents of Mr. Root of earlier date than that which is now in suit. For example, patent No. 246,420, for traction apparatus for wire-rope railways, which was issued and published the 30th day of August, 1881, four days before the filing of the application for the patent in suit, shows in figure 2 of the drawings a cable tube or tunnel designated by the letter B, and precisely like that which is shown, described, and claimed in the patent in suit. Figure 1 in the patent in suit is a reproduction on a larger scale of the lower part of figure 2 in the earlier patent No. 246,420. The earlier patent No. 246,420 contains no claim to the tunnel, but the claim is to a gripping device requiring such a tunnel or a suitable tunnel for its use, and the drawing and specification constitute a complete and sufficient disclosure to one skilled in the art of the precise construction of tunnel subsequently claimed in the patent in suit, the particular construc-
271 tion of the rail connecting and supporting tie or truss in its relations to the track rails and the slot irons being clearly shown, and concrete as a foundation for railroads and other roads and for the construction of sewers and other subterranean passages having been a matter of common public use and knowledge before the grant of said patent No. 246,420.

A still earlier patent, No. 246,210, granted to Mr. Root the 23d of August, 1881, fully represents the construction of bent ties connecting and supporting the rails and supports for the slot irons. The claim in the patent No. 246,210 is to a depression pulley and mountings therefor for sustaining the upward pressure of the cable in passing to an ascending grade "in a railway having a tunnel and travelling cable," and the specification contains no reservation of the right

to claim in a separate patent the particular construction of tunnel shown.

It is apparent that it would be impossible to carry into effect the several inventions covered by patents No. 246,210 and 246,420 respectively, in accordance with the modes disclosed in said patents and following the directions contained in the specifications and drawings and using a concrete foundation such as had been in use on the California-street cable railway for upwards of three years, and was previously well known as a material for railroad foundations without carrying into effect the improvements pointed out in the claims of the patent in suit.

Patent No. 247,781, granted to Henry Root October 4th, 1881, a month after the filing of the application for the patent in suit and about ten months before the grant of said patent, contains a full disclosure of the alleged improvement pointed out in claim 6 of the patent in suit without any reservation of the right to protect said improvement in a separate patent. This patent, No. 247,781, was applied for about four months before the application for the
272 patent in suit, and, as already stated, was issued about ten months before. The fact that the said earlier patent embodies improvements specified in claim 6 of the patent in suit is more apparent by an inspection of figure 2 of the drawing, the upper portion of the foundation and roadway being omitted in figure 1 in order to expose the supplementary tunnel and the rail-supporting ties.

Besides the patent of Eppelsheimer, No. 193,757, with which the application of Root for the patent now in suit was placed in interference, the said Eppelsheimer obtained a patent, No. 224,284, on the 10th of February, 1880, more than a year and a half before Root's application was filed, which also shows and describes a complete and effective truss or tie for supporting the track rails and slot irons and connecting them beneath the tube so as to effectually prevent any relative motion between these parts, and the said patent describes the use of concrete in connection with such rail-supporting ties to form the tube in which the cable is to run. The said patent also refers to the use of planking to form the said tube, which was and is well known as an economical expedient where a cheap and temporary construction is desired, but it also describes, as before stated, the use of concrete, which was well known to constitute a more desirable material for the tube.

I have received from the attorney who made an ineffectual attempt on behalf of Mr. Eppelsheimer to secure for him a rehearing before the Commissioner of Patents after the grant of the patent to Root two letters which were addressed to Mr. Eppelsheimer by his attorney of record at the time the interference was declared and pending, which letters contain the notification to Mr. Eppelsheimer of the declaration of interference and the hearing of the same, and show by the marks of the post office upon them that they failed to reach and were returned to the writer.

273 Counsel for defendant offers in evidence the letters referred to and request the examiner to mark them for identification

Defendant's Exhibit Eppelsheimer's Letter No. 1 and Defendant's Exhibit Eppelsheimer's Letter No. 2, December 7th, 1887, J. A. S., ex'r.

Counsel for complainant objects to so much of the last answer as relates to these letters as hearsay and not proper evidence, and objects to the introduction of the letters as exhibits on the ground that they are not proved to have been written by Alexander and in other respects to be what they are stated to be; also objects to so much as refers to what appears on the records, &c., as not the best evidence.

Adjourned to Thursday, December 18th, 1887, at 10 a. m.

NEW YORK, *December* 8, 1887—10 a. m.

Met pursuant to adjournment.
Present: Counsel as before.

Mr. KNIGHT continues his answer to Q. 4 as follows:

While in San Francisco last month, as stated in the previous part of my answer, I made a personal examination also of the Clay-street hill extension cable railway, which is referred to in the testimony of several witnesses in this case. I found the road-bed, track, and cableway of the said Clay-street hill extension cable railway to be constructed as follows:

The yokes which constitute transverse trusses or ties, to
274 which the track rails and slot irons are secured, are cast of iron in open form, with a central cavity for the cableway, open at the top to permit the passage of the grip-staff, and lateral openings on either side of the central one, through which the material of the road-bed foundation extends. These yokes are set upon a bed of sand and the continuous tube is then formed of concrete resting on the same sand bed, tamped within a suitable mold to give the external contour to the tube or conduit. This extends laterally at the pleasure of the engineer, and may or may not overlap and extend through the lateral openings in the eyes of the yokes; but in any case the concrete tunnel, as I saw it in the Clay-street extension cable road, was practically continuous, cohering firmly to the iron yokes between and around the marginal flanges of the apertures therein, so as to form with the said yokes a continuous structure. It appeared to me to extend in some places beyond the outer walls of the lateral or side openings in the yokes and so as to pass through the said openings—of this I could not judge so well at all points—but it was, of course, a matter of option with the contractor of the road what thickness should be given to the vertical walls of the concrete tube or tunnel. The cast yokes referred to in the Clay-street extension cable railway formed complete and efficient ties connecting the rails and upright supports for the slot irons, in combination with a tube of concrete extending down to the bottom of the said iron ties, and from the nature of concrete naturally and necessarily cohering with the bed forming the common foundation of said iron ties and concrete tube. I therefore found in the Clay-street extension road a substantial anticipation and embodiment of the improve-

ments pointed out in the 1st, 2nd, 3d, 4th, 5th, and 7th claims of the patent in suit, with the exception in reference to the first and second claims, that the concrete did not form the direct sup-
275 port or foundation of the surface of the road-bed or a direct "foundation for the paving," as it is expressed in the patent in suit.

Referring again to the Eppelsheimer patent, No. 193,757—

I should say in explanation of my statement that the said Eppelsheimer patent anticipated improvement pointed out in all the claims of the patent in suit, excepting the fourth, that with respect to the sixth claim of the Root patent Eppelsheimer will be found to refer to brick-work as a substitute for concrete as a material for constructing the tube or tunnel H.

In reference to the notifications to Eppelsheimer as to the declaration of interference between Root and himself and the hearing of said interference, which notifications appear to have failed to reach him, I now offer another letter from C. M. Alexander, of Washington, D. C., dated the 17th day of March, 1883, and transmitting to George Pardy, of San Francisco, who was seeking to secure the rehearing on behalf of Eppelsheimer. The two notifications appear to have been returned to Mr. Alexander through the post office by reason of their failure to reach Mr. Eppelsheimer, and I will here state that I am well acquainted with Mr. C. M. Alexander and his handwriting, and have no doubt that the signatures of Mr. Alexander to these three letters are genuine.

Defendant's counsel here offers in evidence the letters last referred to, and requests the examiner to mark it for identification Defendant's Exhibit Alexander Letter No. 3, December 8, 1887, J. A. S., examiner.

Counsel for complainant objects to so much of the last answer as relates to the letters purporting to be from C. M. Alexander
276 as hearsay, and objects to the offering of the letters in evidence as not having been properly proved.

British letters patent No. 3133 of the year 1877, granted to John Imray upon a communication from William Eppelsheimer, of San Francisco, California, contain a complete representation and description of the bent ties connecting the track rails and the upright supports for the slot irons in combination with a foundation and a tube for the cable formed of concrete, thus fully and exactly anticipating the improvements pointed out in claims 1, 2, 3, 5, and 7 of the patent in suit, and practically claim 4 also. This will be apparent on reference to sheet 6 of the drawing attached to the complete specification of the said English patent and embracing figures 27 to 32, inclusive, and lines 35 to 52, inclusive, of page 6 of the specification.

This complete specification of the Imray patent was filed the 15th day February, 1878, and it is in evidence that the invention in substance as therein described and precisely embodying the claims of the patent in suit was put into actual use in the city of San Francisco in the month of April, 1878, on an extensive scale, to wit, in

the California-street cable railway, in said city, and also embodying in substance the claims of the patent in suit in the Clay-street hill extension cable railway.

A similar use of a concrete tunnel and foundation strengthened with metallic transverse ribs and combined with metal ties to connect the track rails and slot irons is described in English letters patent No. 4800, granted to William Eppelsheimer, and its complete specification was filed and published the 24th of May, 1879. This construction is particularly shown in figures 28 and 29 and described in lines 21 to 26, inclusive, of page 10 of the specification, the use of concrete and strengthening ribs for forming the ropeway as well as the foundation for the road-bed being referred to in the preceding paragraph.

277 A complete disclosure and description of the use of concrete as a foundation for cable railways is found in English patent No. 1581 of 1876, the complete specification of which was filed in the same year. In this the cableway is formed within a slotted rail, and the specification says that the rails are bedded on the same concrete foundation on which the pavement sets, but many earlier examples exist of the use of concrete as a foundation for railways. English old law patent 10606, A. D. 1845, shows and describes a cable railway in which the track rails are connected by ties passing beneath the cable conduit, and states that the "ballasting" is laid flush with the surface of these ties. This description, in view of the common use of concrete for road-beds, would naturally suggest to an engineer the use of concrete to form a cable conduit and road foundation, and the combination therewith of ties connecting the track rails so as to prevent their relative movement.

English old law patent No. 11274, A. D. 1846, describes the use of concrete as a foundation for viaducts and many other structures and as a bed for cars driven by endless belts. The use of concrete for constructing underground tunnels and conduits of various kinds and in some instances for the construction of railroad foundations also is described in the following English patents: No. 1854 of the year 1853, No. 1269 of 1854, No. 2757 of 1859, and No. 3173 of 1865.

It is found from the history of the Eppelsheimer application on which his patent No. 193,757 was granted that he sought to claim the construction of the cable tube or conduit of concrete or the like, and, further, the combination of iron ribs or ties with concrete to form the tube, and that these claims were rejected on reference to U. S. patent No. 38112, granted April 7th, 1863, to Henry Knight, of Brooklyn, N. Y., on the ground that said patent, No. 38112, describes the construction of a pipe or conduit of cement

278 strengthened with iron ribs. An example of the combination of an iron frame or girder with masonary in the construction of underground conduits is found in the patent of Lyman A. Gouch, No. 161,222, March 23d, 1875.

In the patent of A. S. Halledie, No. 182,663, September 26th, 1876, the representation of the road-bed or foundation following the contour of the cable tube would suggest to an engineer the use of con-

crete for this purpose. The construction of a tunnel of concrete in combination with strengthening ribs is also shown and described in the patent of Charles Speir, No. 101,174, March 22d, 1870. Another illustration of the use of concrete strengthened with a frame-work is found in U. S. patent of Samuel T. Fowler, No. 28069, May 1st, 1860.

From examination of the record of the application of Mr. Root for the patent now in suit it is found that claims to the construction of the yoke or tie connecting and supporting the rails and slot irons were rejected by the Patent Office on reference to his earlier patent, No. 246,210, issued August 23d, 1881, a few days before he filed his application for the patent in suit. (Objected to as not being the best evidence.) I find from examination of the previous patent, No. 246,210, that it shows precisely the same construction of bent ties connecting the rails and vertical supports for the slot irons, and it describes or refers to "the tunnel in which the cable travels," leaving the material of which this tunnel is to be made optional with the engineer. In other respects the drawing corresponds with the California-street cable railway road-bed and tunnel, which had been in regular operation for over three years when this patent, No. 246,210, was issued. Another indication of the fact that the Patent Office cannot have intended to grant to Mr. Root claims which would have the effect indicated in his statement of invention where he says his invention "consists in the employment of a con-
279 necting tie for the rails and supports for the slot irons by which both are rigidly supported from the tie and united to each other" is found in the patent No. 249,300, granted to Henry Casebolt November 8th, 1881, during the pendency of Mr. Root's application. This Casebolt patent clearly shows a connecting tie for the rails and supports for the slot irons by which both are rigidly supported from the tie and united to each other. A transverse truss or tie supporting the rails so as to prevent their relative movement while connecting them together is found in the patent of James Stimpson, No. 1262, granted July 26th, 1839. An early example of a cable railway is found in the patent of E. S. Gardiner, No. 19736, granted March 23d, 1858. In this the cable conduit or tunnel is formed with an arched top and contracted slot on the level of the street, so as to avoid any obstruction to the passage of ordinary vehicles. The material of which this cableway or tunnel is to be formed is not described, but it would seem to be competent for an engineer to construct the tunnel of any suitable material. The claim in this patent of E. S. Gardiner is in the following words: "Forming between the rails of a city railroad track an underground tunnel and hanging a series of pulleys within the same, the said tunnel having a longitudinal slot at or near the level of the ground and being otherwise so arranged that a rope may be used for drawing the cars along the track without impeding the passage of the vehicles across the same."

The principle of connecting the track rails and slot irons rigidly together by means of metallic ties or transverse truss frames in such a manner as to provide a tunnel and a slot at the top thereof for the passage of a traction device by which cars are drawn along the

track is well exemplified in the patent of Abel Thompson, No. 131,913, granted October 1st, 1872. Figure 3 of the drawing of this patent shows the metal truss or yoke detached from the
280 masonry, of which the continuous walls of the tunnel are formed, while figures 1 and 2 represent the mode of combining this yoke or truss with the tunnel and supporting the track rails thereon. In view of the state of the art it was certainly within the knowledge of engineers at the time this Thompson patent was issued to substitute concrete for brick work in the construction of the tunnel walls, and also to construct the tunnel of any preferred size or shape, and hence I am of the opinion that the structure shown and described in the Thompson patent, with the addition of the traction apparatus which was in use in cable railways and published in a number of patents which have been referred to in evidence before the date of Mr. Root's invention, and substituting concrete for masonry, would constitute a practical embodiment of the alleged inventions set forth in the 1st, 2d, 3d, 4th, and 7th claims of the patent in suit, while, as shown in the drawing and specification, the said Thompson construction appears to embody precisely the device pointed out in claim 6 of the patent in suit.

Adjourned to Friday, December 9th, 1887, at 10 a. m.

NEW YORK, *December* 9, 1887—10 o'clock a. m.

Met pursuant to adjournment.
Present: Counsel as before.

OCTAVIUS KNIGHT, Esq., continues his answer as follows:

The drawing and specification of the Thompson patent disclose a complete and effective mode of connecting the track rails and slot irons by means of ties or yokes combined with a slotted tunnel to receive the traction apparatus. The track rails are shown in
281 position in figure 1, and, although the fastenings of the rails are not fully represented, the use of customary or suitable fastenings is necessarily implied and understood.

Plaintiff's counsel objects to so much of the answer to question 4 as states what is contained in records, etc., not in evidence.

Q. 5. Have you examined and do you understand Complainant's Exhibit No. 2? If yea, explain how far, in your judgment, this exhibit or the structure which it represents embodies the improvements pointed out in the claims of the patent in suit, giving your reason in full for any opinions you may express.

A. I have carefully examined the exhibit mentioned in the question. I find that it represents a construction of cable railway with yokes similar in form and function to those used in the Clay-street hill cable railway in San Francisco, which I examined last month and which is referred to in the testimony in this case taken in the city of San Francisco. These yokes, as I understand, were originally used in that road and in other roads in San Francisco, the cable tubes made in part of wood, but subsequently to this and prior to

the construction under Mr. Root's direction of the California-street cable road, which embodied the alleged invention pointed out in the patent in suit, a tube or tunnel of concrete was made in connection with similar yokes in the extension of the Clay-street hill road. This concrete tube of the Clay-street hill extension closely resembles that shown in Complainant's Exhibit No. 2, as will be understood from the testimony of Hanscomb and others. In the Clay-street hill extension as in Complainant's Exhibit No. 2, the yokes are formed with a central opening conforming to the shape of the tube and lateral openings through which the foundation of the road-
282 bed extends and the concrete is laid in approximate coincidence with the inner surfaces of the central opening in the yoke and extending downward to the same foundation on which the iron yokes rest. The concrete naturally coheres strongly around the flanges of the yoke, and its lateral extension is of course optional with the engineers. The yokes in Complainant's Exhibit No. 2 resembles those in the Clay-street road, the California-street road, and the cable roads in other parts of San Francisco and elsewhere in forming rigid supports and connections for the track rails and slot irons so as to prevent any relative movement of these parts.

Referring to the claims in the patent in suit, I find that Complainant's Exhibit No. 2 embodies in a cable railway a tie connecting the rails and providing upright supports for the slot irons, though these parts are not constructed as described in the patent in suit, and moreover I do not find in Complainant's Exhibit No. 2 "a concrete foundation" in the sense in which this is used in the specification of the patent in suit, where the only use of the term "foundation" is "a foundation for the paving F." This agrees with the representation in the drawing of the patent in suit where the concrete is made to form the foundation upon which the pavement is laid. Complainant's Exhibit No. 2 shows the concrete employed only to form the tube and not extending upward so as to constitute the foundation on which the pavement is laid, though the concrete tube will naturally lend additional strength to the whole foundation of the road. This is equally true in the Clay-street hill construction as testified to by Mr. Hanscomb. For these reasons I do not find in the Complainant's Exhibit 2 an embodiment of claim 1 or claim 2 of the patent in suit.

Referring to claim 3, if this is to be read as covering broadly the combination of track rails, connecting ties, and a tube of concrete, it certainly is embodied in Complainant's Exhibit No. 2 or
283 the structure represented thereby, and equally so in the Clay-street hill construction, but if the special reference to the "ties A" in claim 3 or other reference to the specification or drawing shall be understood to differentiate the improvement pointed out in claim 3 from the Clay-street hill construction the same difference will exist between the device pointed out in claim 3 and that shown in Complainant's Exhibit No. 2.

Referring to claim 4, I find that Complainant's Exhibit No. 2 does not embody in a cable railway "the rails and slot irons supported and united by the ties A in combination with a continuous

surrounding mass of concrete or equivalent material forming a bond and a support for the roadway."

Referring to claim 5, I do not find in Complainant's Exhibit No. 2 "connecting ties consisting of bent bars embracing and supporting the tube."

Referring to claim 6, I do not find in Complainant's Exhibit No. 2 "the combined rails, slot irons, and connections supported by a masonry foundation built to form the tube or part thereof." Neither do I find in Mr. Hunter's description of this exhibit nor of the structure which it represents any foundation for his allegation that the invention pointed out in said 6th claim is embodied in said exhibit.

Referring to claim 7 of the patent in suit, I find, as in the case of claim 3, that any broad interpretation of this claim, which is "in a tramway track for wire and rope railroads a tube to receive the rope or cable made of concrete or equivalent material, open at the top and combined with iron ribs," would certainly be embodied in Complainant's Exhibit No. 2 or the structure represented therein, and equally so in the Clay-street hill construction, and also in the structures made with concrete tubes and narrow ribs referred to by Mr. Hunter, expert witness for the complainant, in his description of the prior art. Such construction would also be embodied
284 in devices represented in a number of earlier patents to which I have referred in the deposition.

Direct examination closed.

OCTAVIUS KNIGHT.

Sworn to before me—

JOHN A. SHIELDS, *Examiner.*

Counsel for respondent may insert printed copies of U. S. letters patent, Blue Book copies of English patents, with the same effect as if they had been duly certified, subject, however, to correction by either party by the insertion of certified copies prior to the hearing.

Defendant's counsel here offers in evidence Patent Office copies of drawings and specifications of United States letters patent and Blue Book copies of English patents referred to in the evidence, and requests the examiner to mark them for identification in each case defendant's exhibit with the name of the patentee and the number of the patent.

Complainant's counsel objects to the introduction in evidence by defendant's counsel of any patents not set up in the answer.

Cross-examination deferred, subject to agreement of counsel.

285 United States Circuit Court, Southern District of New York.

HENRY ROOT, Complainant,
*vs.*
THIRD AVENUE RAILROAD COMPANY, Defendant. } In Equity. No. 3866.

Testimony taken by agreement of counsel on the part of the defendant, under and pursuant to the 67th rule of the Supreme Court of the United States, as amended, before Phillip A. Mauro, Esq., notary public.

WASHINGTON, D. C., *January 20th*, 1888.

Present: George J. Harding, Esq., of counsel for complainant, and Harry E. Knight, Esq., of counsel for defendant.

Cross-examination of OCTAVIUS KNIGHT:

X Q. 6. Please state what, in your opinion, you consider to be the thing or combination claimed in the patent in suit which was believed to be novel by the patentee.

A. I understand it to be a metal tie connecting the rails in combination with supports for the slot irons, which prevented unequal settling or relative movement between the said rails and slot irons, and with a body of concrete or equivalent material forming a foundation for the entire road-bed and uniting the whole into a continuous rigid structure.

286 This alleged invention is covered under different formulas in the several claims, as I have explained in detail in my direct testimony. As shown and described by the patentee, the continuous body of concrete completely surrounds the iron frame-work by which the track rails and slot irons are connected, as particularly pointed out in claim 4 of the patent.

X Q. 7. Then you do not believe that the only novel feature which the inventor describes is that of a "connection tie for the rails and supports for the slot iron"?

A. No; this is not claimed as new, broadly and separately from the concrete foundation.

X Q. 8. Then you do not believe that the only novel feature which the inventor had in mind was the connection tie as described?

A. I do not find that the inventor alleges novelty in the concrete tube of itself. It does appear to me, from the language of the patent, that he regarded the connecting ties as the prominent distinguishing feature in the combination which he claims, though he does not claim them apart from the combination, excepting where, under claim 5, he refers to connecting ties consisting of bent bars, which claim is not, as I understand, under consideration in the present case, and he further refers to the concrete as completely surrounding the ties and forming a foundation for the road-bed.

X Q. 9. Then you do believe that the only novel feature which the inventor had in mind was the connection tie as described?

A. No; he appears to have thought it was new to combine with such connecting ties a surrounding mass of concrete which would

constitute a foundation for the road-bed and unite the whole in a continuous rigid structure.

X Q. 10. In your opinion, must the surrounding mass of concrete be a continuously surrounding mass, in order to fulfill that second novelty which you said the inventor believed existed?

287 A. I think it must. It is so referred to in the statement of invention.

X Q. 11. Please point out the line or lines and page of the specification of the patent in suit in which, in your opinion, this statement occurs.

A. In lines 13 to 16, inclusive, of page 1 it is referred to as a substratum of concrete uniting the whole into a continuous rigid structure. In lines 74 and 75 of same page it is referred to as "the concrete in which the ties or frames are bedded." In lines 79 to 81, inclusive, it is referred to as forming "a foundation for the paving" and providing "an even and durable roadway which cannot settle below the level of the rails or slot irons." Then, in claim 3 the concrete is referred to as forming the cable tube and in claim 4 it is referred to expressly as constituting a continuous surrounding mass, forming a bond and a support for the roadway.

X Q. 12. That is the only reference to the specification, is it?

A. There are other allusions to advantages which result from having the concrete continuous lengthwise of the road and extending laterally on each side of the tube, so as to form a bed for the entire roadway.

X Q. 13. Does not the specification of the patent in suit, lines 3 to 10, page 2, read as follows: "It will be seen that a distinguishing feature of my invention is the connecting of the rails in the same structure as the slot irons and the tube, so that all the parts are maintained in their relative position and whatever may occur to alter the place of one will have no effect unless the change is sufficient to affect the whole structure"?

A. It does.

X Q. 13*a*. You saw the Clay-street hill extension in California, did you not?

A. I did.

X Q. 13*b*. And I suppose you are familiar with the construction of that road?

288 A. I believe I am.

X Q. 14. And you believe that the connecting ties and yoke used there is similar to the one in use by the Third-avenue road, the respondent in this suit?

A. No; the yoke used on the Clay-street hill extension cable railway is a single casting, whereas the yoke in use on the Tenth-avenue and 125th-street cable roads, in New York, is made up of two castings connected by a wrought-iron beam and with separate tie-rods for the slot irons, the slot irons and rails being, however, seated directly on the yoke, as is the case with the Clay-street hill extension.

X Q. 15. But you think the Clay-street hill road embodies the in-

tegral metallic structure or yoke shown in the patent in suit? Am I right?

A. It embodies a structure possessing the distinguishing feature set forth in the quotation from lines 3 to 10, inclusive, of page 2 of the patent in suit, but not a yoke possessing the particular details of construction set forth in the specification.

X Q. 16. Has it the distinguishing feature set out in lines 9, 10, 11, and 12 of the first page of the specification of the patent in suit? I am now speaking and have been speaking *to* the metallic structure, without any reference to concrete whatever.

A. It has.

X Q. 17. Has the construction of the Third Avenue Railroad Company such a construction as is set out in lines 9, 10, 11, and 12 of the 1st page of the specification of the patent in suit?

A. It is so shown in the Complainant's Exhibit No. 2, and this agrees with the construction employed by the Third Avenue Railroad Company on their 125th-street cable road, to the best of my recollection, in respect referred to in the question.

X Q. 18. Upon what did the yokes of the Clay-street hill road rest?

289 A. They rest upon a foundation of sand, which, as the road is built, becomes united to a greater or less extent with the concrete used in forming the cable tube or tunnel and formed upon or extending down to the same sand foundation.

X Q. 19. You are positive, are you, of your own knowledge, that this concrete extended down to the sand bed?

A. I obtained the best evidence I could in regard to this by going out to a place upon the road where it was in course of repair, having the workmen who were engaged upon it uncover the road so far as they could without injury to the structure—that is to say, by removing the planking which, on that road, is used to form the surface of the roadway—and by obtaining full explanations on the spot from one of the workmen who was, I found, familiar with the way in which the road was built, and this and my own personal observation I became satisfied that the concrete extends down to the same sand foundation. The workmen told me positively that it extended down to the bottom of the yoke; that both the concrete and the yoke were laid upon a level foundation of sand, and I confirmed or corroborated the understanding I thus gained by examining the road from below where the tunnel is connected with the power-house, at which point I went underneath the road.

All that portion of the answer commencing "The workmen" to "and I corroborated" objected to as incompetent and inadmissible.

X Q. 20. How far above the bottom of the tube were the cable-carrying sheaves?

A. I cannot give this accurately. I was not specially concerned in examination of the cable-carrying sheaves, and at the particular point where I saw the road uncovered, or in the yoke which I there examined, one of these sheaves was not located.

290 X Q. 21. There was a central orifice and a metallic yoke, was there not, in the form of a tunnel?

A. There was.

X Q. 22. Was the bottom of this open in the bottom of the tunnel?

A. To the best of my observation the bottom of the tunnel was nearly or quite coincident with the bottom of the central opening in the yoke, but the surface appeared continuous, as if the material of the concrete were carried over the surface of the iron at the point where I saw it, so as to form a continuous smooth interior.

X Q. 23. What was the depth of the concrete?

A. It extended from the base of the yoke to the bottom of the central orifice in the yoke and up on the sides to a sufficient height to leave room for the planking, of which the surface of the roadway is formed. I cannot give the depth in inches.

*Q Q. 34.* Do you know how the tunnel and yokes of the cable road of the Third Avenue Railroad Company are constructed or laid in the street?

A. I do, substantially.

X Q. 25. Please describe how they are laid in the street.

This question and also questions 17 and 24 objected to as not proper cross-examination.

A. They are laid on the same principle which I have described with reference to the Clay-street hill construction—that is to say, the yokes are set up in position and a tube of concrete is formed extending down to the base of the yoke and up the sides about coincident with the surfaces of the central opening in the yoke and extending through lateral openings which are formed in the yokes, as in the Clay-street hill yokes, in San Francisco.

291 X Q. 26. You are positive, are you, that the yokes in the Third Avenue Railroad Company conduit are set upon a bed of sand or earth, are you?

(Same objection.)

A. They are set up in position and the concrete tube is afterward formed between them. I have seen this operation in progress, but do not remember that I critically examined the character of the foundation beneath the yokes and tube.

X Q. 27. Then you know whether or not the yoke on the Third Avenue Railroad Company's conduit has its lower surface embedded in concrete or whether it rests upon a bed of sand or clay?

(Same objection.)

A. I do not recollect that I examined or saw what was underneath the yokes or the concrete tube.

X Q. 28. Referring to Complainant's Exhibit No. 2, was not the concrete, as illustrated there, found in the Third Avenue Cable Railroad Company—the respondent's—road of the width shown in said exhibit and a continuous concrete substance extending through the yoke? Am I right?

(Same objection.)

A. I cannot detect in the exhibit any departure in this respect from what I saw of respondent's structure.

X Q. 29. Then you do find in the Third Avenue Railroad Company's cable road a structure in which the rails, the slot irons, and the tubes or tunnel are formed into a practically single structure?

(Same objection.)

A. Yes; it may be called a single structure.

X Q. 30. Does not the patent in suit state that the use of concrete for conduits was well known?

292 A. It does.

X Q. 31. Then you think (referring to the patent in suit) that if I do not project that portion of the cement forming the direct wall of the tube out to a point under or beyond the track that I will not have a structure in which there is combined the elements of any of the claims of the patent in suit? I refer, of course, to the claims in suit, and you are to take the Clay-street hill road to represent the prior state of the art.

A. I do not find this limitation in claims six and seven, nor do I think it would necessarily exist in claims one and two, though the terms of these two claims explained by the specification do appear to refer to a concrete foundation, forming a support for the surface of the road-bed. Claim three is silent as to the extension of the concrete upward or laterally, but in common with claim seven appears to be embodied in the Clay-street hill construction referred to in the first one.

X Q 32. Then you think those claims could be avoided if the concrete did not extend entirely to the track rail?

A. I have just stated that I do not find this limitation in the claims.

X Q. 33. Take these claims as you understand them when you state when "explained by the specification;" then please answer my last question. I refer to claims one and two of the patent in suit.

A. The specification, lines 77 to 85, inclusive, of page one, says: "This concrete forms a support for the iron-work, the bottom and sides of the tube, and a foundation for the paving F, which fills the space between the rails and slot irons, thus forming an even and durable roadway which cannot settle below the level of the rails or slot irons or cause a side pressure on the tube, as is the case where the roadway is supported on sand or other independent foundation." This constitutes the explanation of what the patentee means by the term foundation, which appears in the first and second

293 claims, and while it is manifest that the advantages explained in the above quotation, especially as to the protection of the road-bed from settling relatively to the track rails, could not be so fully availed without extending the concrete all the way to the track rail, I did not and do not feel prepared to say that some sort of a foundation for the road-bed might not be furnished by the concrete without extending it exactly to or beyond the track rails. I do understand that the concrete must form the foundation

of the road-bed in order to embody the invention set forth in claims one and two. As I first answered question thirty-two I did not understand it as referring exclusively or particularly to claims one and two.

X Q. 34. Now that you have made this explanation, will you please answer the last question?

A. I do not know how to answer it more fully than I have done.

X Q. 35. Then you cannot answer me whether or not claims one or two would be avoided by not extending the concrete up to or beyond the track rail?

A. It must, in my opinion, extend practically or substantially to the track rail in order to embody the invention pointed out in claims one and two.

X Q. 36. When you quoted in answer to Q. 3 of your direct examination "the first claim thus sets forth and embraces * * * in combination with a concrete foundation for the road-bed," you did not intend to imply that the words for the road-bed appeared in the claim, did you?

A. No; on the contrary, I stated expressly that I was compelled to go to the body of the specification for an explanation of the word foundation.

X Q. 37. Now, referring to the same answer, you state, "The first and second claims refer to the combination with the track-supporting or rail-connecting ties of a body of concrete, which by reference to the specification" * * * You also state in the same
294 answer, "The specification then proceeds to describe a mass or body of concrete in which the ties or frames are bedded at suitable distances to support the rails and slot irons which form the top of the tube." * * * Now, will you kindly tell me whether that last statement of yours does not refer to the "foundation" set out in the first statement of yours in this question?

A. The foundation of the road-bed is formed of the same body of concrete in which the yokes or ties are bedded. I understand the expression in which the ties or frames are bedded to explain or imply that the concrete surrounds the yokes, while the term foundation necessarily refers to an under support, and, as the word foundation is only used in the body of the specification with reference to the support of the roadway, I am of the opinion, as already stated, that this is the proper explanation of the term as it appears in the 1st and 2d claims, the roadway being a necessary feature or condition of a cable railway for city streets.

X Q. 38. You stated in answer to X Q. 31 that the Clay-street hill extension embodied the 3d and 7th claims of the patent in suit. Did or did you not so answer upon the theory that in the Clay-street hill road is found a structure in which the tube or tunnel, the rail supports, — slot irons are formed into one single structure?

A. I did not, as I do not find this limitation in claims 3 and 7, although I did find the condition to exist in the Clay-street hill structure, to the best of my observation, the concrete extending in places through the openings in the yokes as well as uniting with the sand foundation beneath them.

X Q. 39. Taking it for granted that such a limitation as that be put to claims 3 and 7, to wit, that in said claims the tube or tunnel, the rail supports, and slot irons are formed into one single structure, and suppose in the Clay-street hill extension they are not so formed in a single structure, do you then think that the Clay-street
295 hill extension would embody those claims—that is, the 3d and 7th—with the limitation stated?

A. If the claims had limitations which did not exist in the Clay-street hill construction, the Clay-street hill construction would not embody the improvement pointed out in the claim. This is as I understand the question.

Question repeated.

A. If the 3d and 7th claims were limited to a tube or tunnel, rail supports, and slot irons formed in one single structure, and in the Clay-street extension these parts were not so formed in a single structure, I do not think that the Clay-street hill extension would embody the said claims with the limitations stated.

Adjourned till 10 a. m. Saturday morning.

WASHINGTON, D. C., *January* 21*st*, 1888.

Met pursuant to adjournment.

Cross-examination of OCTAVIUS KNIGHT continued:

X Q. 40. Counsel for complainant not waiving any objection heretofore made in the direct examination, he asks the following questions *de bene esse:* The rules of the Patent Office, I believe, and the statutes provide that interferences shall be declared between a pending application and a patent already granted. Am I right?

A. Yes.

X Q. 41. You state in your direct examination that the Imray letters patent No. 3133 of the year 1877 contain a complete representation of the bent ties, &c., thus fully and exactly, in your opinion, anticipating the claims in this patent. Will you please point out the figure and the lines or line?

296 A. The bent ties connecting the rails and the upright supports for the slot iron are shown in figures 27, 28, 29, 30, and 31, sheet 6, of the drawing of Imray's English specification, No. 3133 of 1877, and described on page six of the specification, lines 35 to 52, inclusive. The said drawing and description also refer to the use of concrete and strengthening ribs for forming the tube, the said concrete forming a foundation in which the yokes or bent connecting ties are embedded. Figure 27 appears to indicate the formation of the surface of the road-bed of large blocks of stone or some other material resting directly upon the concrete foundation. Figures 27, 28, and 30 show clearly the tie connecting the rails, the upright supports for the slot iron, and a concrete foundation substantially as set forth in claims 1 and 2 of the patent in suit. Figure 27 and the description embraced in lines 35 to 40, inclusive, of page 6 show and describe the combination of rails, ties, and a tube formed of concrete or equivalent material, substantially as set forth

in claim 3 of the patent in suit, and figures 27, 28, 29, 30, and 31, with the description thereof embraced in lines 35 to 43, inclusive, of page 6, fully represent and describe a tramway track for wire-rope railways and a tube to receive the rope or cable, made of concrete or equivalent material, open at the top and combined with iron ribs, as set forth in claim 7 of the patent in suit.

The bent ties of channel iron are shown and described as connecting the track rails, and the vertical supports of the slot irons are secured to the said bent ties, as are also struts or braces by which the slot irons are firmly held, so that the entire structure carries out the useful purposes set forth by Mr. Root in the 1st column of page one of his specification, preventing any relative or unequal settling or movement of the track rails or slot irons.

X Q. 42. The only statement of the use of concrete in lines
297 35 to 52, page 6 of the Imray specification, is as follows:
"This tube is made of concreate or similar material;" am I right?

A. The statement is: "This tube is made in concrete or similar material K, strengthened by ribs B at intervals." This is the only allusion to the use of concrete which I find in lines 35 to 52.

X Q. 43. Please look at English old law patent 10606 of 1845, and state where concrete is shown or described in that patent.

A. I do not find any direct reference to concrete in this patent.

X Q. 44. Please look at English old law patent No. 11274 of 1846, and state whether there is described or shown in that patent a tube or tunnel.

A. I do not find that this patent shows an underground tube or tunnel. The cable appears to lie on the surface of the ground running between the carrying wheels on which the carriage move-.

X Q. 45. Are there any tracks?

A. There are no fixed rails forming a customary track shown in figure 1 and the other figures illustrating this form of the invention, but in figure 30 track rails are shown with the cable running between them.

X Q. 46. You referred in your direct examination to this patent as showing the use of concrete; was not that statement of yours taken from the following statement in the patent: "Figure 1 represents a side elevation * * * *a*, planks of wood, forming a base on level ground and on inclines of flat or even surfaces, and may be laid on concrete as the nature of the ground shall require"?

A. Not exclusively. This is one of several references to the use of concrete; for example, it is referred to in the description of figure 20, indicated by the reference $z^2$, line 37, page 6. Again, I find on page 11, lines 24, 25, 26, the following: "I claim the use of concrete
for a foundation for viaducts, stantions, piles, and bearers,
298 in combination with carriages, gliding or traveling on the
peripheries of wheels, as above described.

X Q. 47. Please look at English patent No. 1854 of the year 1853 and state whether that patent shows or describes anything more than what is termed in that patent "a calcareous cement conduit"—that is, so far as is germane to the matter in controversy.

A. It refers only to tunnels and conduits for various purposes, made of what the patentee calls "calcareous cement," which he described as made up of lime, sand, and powdered limestone.

X Q. 48. Please look at letters patent of Great Britain No. 3173 of 1865 and state the line or lines of the specification and the figures in the drawing you referred to in your statement in reference to this patent in your direct examination.

A. Page 5, lines 3, 4, 5, referring to the tube or tunnel, the specification says: "It may also be formed of any available or suitable material, such as brick, stone, ashlar, or rubble, and, if the latter, be smoothly plastered inside. I prefer, however, a cast-iron invert embedded in concrete." Again, on page 11, lines 11 and 12, referring to another embodiment of his invention, the patentee says: "I prefer to construct the tunnel of stone, brick in cement, or glazed tiles backed with concrete." On page 16, lines 10 to 15, inclusive, referring to the railway tube or tunnel, the patentee says: "It may also be formed of any available and suitable material, such as brick, stone, ashlar, or rubble, and if of the latter the tube should be smoothly plastered on the inside. I prefer, however, to use a cast-iron invert, as shown in figure 2, cast in five-feet lengths and embedded in concrete, the several castings to be well jobbled and bolted together." Again, on page 23, lines 5 and 6, the patentee repeats as follows: "I prefer to construct the tunnel of stone, brick in cement, or glazed tiles backed with concrete." The above quotations describe the use of concrete for constructing an under-
299 ground tunnel, and also the use of concrete in the construction of a railroad foundation.

X Q. 49. Please refer to 2757 English patent of 1859 and state the same in reference to that exhibit as you were asked with reference to the Exhibit 3173 of 1865.

A. Page 1, lines 9 to 18, the patentee says: "My invention relates to the manufacture of beton or composition having lime for its base, and produced, according to my invention, in an agglomerated and plastic state, with but a comparatively small quantity of lime. It may be used as artificial stone, as material for erecting various structures, and for numerous purposes of paving, covering, building, and constructing articles, structures, surfaces, and works; and it is especially adapted for erecting sea walls and other sea-works and for purposes generally where resistance is desirable to frost, damp, rough weather, wear and friction, concussion, crushing pressure, streams, and absorption of liquids and vapours and chemical action of sea water and neutral and alkaline salts." Pages 4 and 5, commencing with line 38 of page 4, the patentee says: "My improved betons admit of agglomeration, and they are applicable for constructing sea walls, embankments, and other works exposed to the waves, tunnels, monolyth surfaces and structures, turn-table wells, and other railway works, dykes, piers, and other water works, mine gallery columns, pavings, roadways, roofings, facings for ramparts, and other fortifications (which may be filled with a particular clay beton), elevated structures, light-houses, telegraph-wire protectors, tubes, tanks, steps, ornamental mouldings, and for many other uses."

On pages 9 and 10 the patentee mentions: "Among the numerous uses to which my improved betons may be applied" * * * "3. Flagging, paving, and covering surface for roads. * * * 4. Flagging for railway or monolythic surfaces, forming length and bread-wise permanent way, on which rails or other ap-
300 pliances may be fixed, wood sleepers and chairs being dispensed with. * * * 5. Trenches, ditches, drains, conduits, etc. * * * 12. Railway works, as tunnels, viaducts, bridges, turn-table wells, monolyth tanks, tank columns, etc. * * * 16. * * * culverts, viaducts, sewers, * * * etc. 17. Monolyth roadways, the upper surface forming a road and the under surface an arched ceiling for a subterraneous road, longitudinal passages being provided in the thickness to form fluid-tight channels for gas, water, &c., instead of the tubes now used. 18. Tubes for gas, water, and the like."

X Q. 50. Please look at English patent 1269 of 1854 and state what is the object for which this reference was cited, and also please state the line or lines which is relied upon by you for the statement in your direct examination in reference to this patent.

A. On page one of this specification, in lines 7, 8, 9, the patentee says, "This invention consists in applying small slates, lathed in cylindrical form, overlapping each other and cemented together, to the construction of conduit pipes." I do not find in this specification an express reference to "concrete." What I relied on in citing it was the fact that the use of fragments of slate laid together, with their interstices filled with cement and molded in tubular shape for the construction of a conduit as described in the specification, may be regarded as suggesting the use of fragments of stone, together with cement, molded into a conduit.

X Q. 51. You are asked in the last question to point out the line or lines in the specification of the patent 1269 of 1854 upon which you relied for your statement in reference to that patent in your direct examination, and you state page 1, lines 7 and 8, of the specification. Is that all the answer you desire to give to the last question?

A. I used the term "concrete" in my last answer in its technical sense or in the more restrictive sense in which it is used to
301 refer to a composition of rock or gravel or other silicious matter with lime or calcareous cement, so that the composition will form a monolythic structure. The specification of the English patent No. 1269 of 1854 does, however, make use of the term concrete in a less restricted sense and in general terms, which are broad enough to comprehend the customary concrete of broken stone and cement, which is commonly used by engineers for foundations and other underground works. On page 3, lines 5 and 6, the patentee refers to his structure as "consisting of slate and iron cemented and concreted with asphalt or other suitable cement." On page 4, lines 6 to 9, he speaks of pouring asphalt into the mold, "so that it may flow down amongst the slates and fill up the interstices and make a solid concrete of the whole."

X Q. 52. Does not the patent state, page 3 of the specification,

line 7, the following: "The slates preferred for this purpose are about ¼ inch thick and about twelve inches to about 18 inches long and from about 3 inches to five inches wide, the narrow slates being used for pipes of small diameter and the wider slates for pipes of larger diameter"?

A. This is a direct quotation from the specification.

X Q. 53. Will you look at the Defendant's Exhibit Knight Patent, No. 38112, and state what that patent describes?

A. It refers in the first place to a "combination cement and metal pipe," patented to the same inventor the 27th of August, 1861, and proceeds to describe a mode of making strong and water-tight joints between the sections of these cement and metal pipes. The pipe is described and shown with a thin outer "frame or strengthening tube" of sheet metal, while its main body is made of cement, or in other places in the specification it is described as "hydraulic cement mortar."

302 X Q. 54. And the statements in your last answer are all and what you rely upon in that patent. Am I right?

A. This embraces all that appears to me important. I referred to it simply as an illustration of the use of calcareous or hydraulic cement in the formation of underground conduits.

X Q. 55. Please look at the Defendant's Exhibit Gouch Patent, No. 161,222, and state what is shown and described in said letters patent, and also please state the purpose for which that exhibit was cited.

A. The Gouch patent referred to describes a sewer constructed in part of mason-y with a metallic base or foundation. It was referred to simply as an illustration of the combination of a strengthening frame of iron with masonry in the formation of an underground conduit.

X Q. 56. In that patent does the cement form the entire conduit or sewer?

A. No. The structure is described as "an arch of masonry of oval form, or approximately so, the lower portion of which rests upon an iron girder."

X Q. 57. Then, as I understand you, the cement does not surround or envelop what you call the girder?

A. No; the masonry rests upon what the patentee calls the girder.

X Q. 58. What claims of the patent in suit you think this patent is anticipatory to?

A. It does not, in my opinion, anticipate either of the claims of the patent in suit. I have never referred to it as an anticipatory of any one of the claims.

X Q. 59. Do you think the Knight patent does?

A. I do not.

Adjourned by consent to Thursday, 27th January, 1888, at eleven o'clock.

303 WASHINGTON, D. C., *Jan.* 27, 1888.

Met pursuant to adjournment.

Present as before.

X Q. 60. Please look at the patent of A. S. Hallidie, No. 182,663, September 26th, 1876, and please state whether there is any yoke or connecting tie between the two rails and a support for the slot iron.

A. The patent shows and describes a tube (B) with upwardly projecting flanges forming between them, "a longitudinal slot, *d*, through which the griping device passes in order to connect the car with the rope." These upwardly projecting flanges, if made of iron, constitute the slot iron, and are supported from the tube or tunnel, but the material of which the tube or tunnel is made I do not find to be stated. In regard to the connection with the track rails, these are shown mounted on short ties, but whether these short ties are connected to the tube or tunnel is not stated.

X Q. 61. Are not these "upwardly projecting flanges" shown integral with the tube?

A. They appear to be.

X Q. 62. Now please look at the patent of Charles Spear, and state what, in your opinion, is described in said patent.

A. The patent of Charles Spear, No. 101,174, shows and describes a tunnel formed of concrete and a frame-work consisting of ribs and planking.

X Q. 63. Does it describe or show anything more than covering the sides of a tunnel with concrete?

A. Yes; the frame-work is completely embedded in concrete, which is shewn filling the interstices or spaces between the ribs and between the shells or planking.

X Q. 64. For what purpose, so far as relates to this case, were these last two patents cited?

A. The Hallidie patent, No. 182,663, was cited as showing a road-bed or foundation following the contour of the cable tube,

304 and in my opinion calculated to suggest to an engineer the use of concrete for forming the cable tube and foundation in view of the common use of concrete in roadways and the representation of the road-bed given in figure 1 of Hallidie's drawing. I might also add that it illustrates the supporting of the slot bars from the shell or frame-work, which gives contour to the tube. The patent of Spear, No. 101,174, was referred to as an example of the use of concrete in combination with a frame-work which gives contour and strength to the tunnel.

X Q. 65. But there is no language in the Hallidie patent which speaks anything about the foundation, is there?

A. No; the foundation is not particularly described.

X Q. 66. Is anything said about it?

A. The specification speaks of a street railway having an underground tube or tunnel for the rope and gripping apparatus. This, of course, is a reference to a railway foundation or road-bed, though, as I said before, the particular construction of the road-bed is not

described in the specification excepting so far as to say that it has a tube or tunnel in which the rope and gripper travel.

The answer is objected to as irresponsive.

X Q. 67. Does the specification contain any direct reference to or statement about what you call the foundation?

A. It does.

X Q. 68. Please point out the line or lines.

A. In lines 4 and 5 of page 1 the invention is described as an improvement in railroads, and in the following lines the patentee states that his description and the accompanying drawing are sufficient to enable any person skilled in the art or science to which it most nearly appertains to make and use the said
305 invention or improvement without further invention or experiment. This refers to the road-bed or foundation shown in the drawing as well as to other parts of the structure. From line 42 to the bottom of the first column of page 1 the patentee describes or refers directly to "a street or other railway," referring to the drawing in figure 1 of which such a railway with a very solid looking foundation is represented. In lines 25 to 27 of the 2d column of page 1 he refers to the roadway as often built over uneven and hilly ground. The rest of the specification refers to the cars and gripping apparatus to which the patent particularly relates.

X Q. 69. Then, as I understand, you claim to find the direct references as asked in the cross-questions 67 and 68 in the following portions of the specification, and no others: Lines 4 and 5, page 1; line 42 to the bottom of the 1st column of page 1; lines 25 to 27, 2d column of page 1. Am I right?

A. The 2d and third paragraphs of the first column of page 1 refer to roadways in general and to this patentee's improvement. These references and those referred to in the question, taken in connection with the drawing which forms a part of the specification, I believe are all.

X Q. 70. Now, please look at the patent to Fowler, No. 28069, and state, 1st, what is therein described and shown; and, 2d, the purpose for the citation of that patent in this case.

A. The patent of Fowler shows and describes a mode of constructing walls of concrete with a wooden frame, the concrete serving to cover and protect the frame, while the frame binds the parts of the concrete wall together. It was referred to as an illustration of a concrete structure with a strengthening frame-work embedded in the concrete.

X Q. 71. Please look at the letters patent No. 246,210, and state (1) whether there is any claim for a tie which is common to
306 both tracks or a tie which connects the rails and the upright supports for the slot irons, and also whether there is any statement in the specification as to the construction of the tunnel itself, beyond the statement line 34, 1st page, "D represents the tunnel in which the cable E travels."

A. There is no claim in this patent to a tie which is common to both tracks or a tie which connects the rails and the upright sup-

ports for the slot irons. The specification contains the following description of the ties, which are clearly shown in the drawing connecting the track rails and having such a bent form as to accommodate the travelling cable and grip: "Let A represent the rails set on appropriate supports B." The reference letter B is placed on the bent connecting ties as well as on the chairs or standards on which the track rails directly rest. These ties thus bent form a part of the tunnel structure. The only other allusion I find to the tunnel is in lines 58, 59, and 60, where it is referred to as of sufficient depth to accommodate the depression pulley supports to which the patent specially relates, and there is an incidental allusion to the tunnel on line 74, but having no relation to the purpose of the question, as I understand it.

X Q. 72. The "ties" on my last question are not an element in any claim of the patent, are they?

A. They are not.

X Q. 73. Now, referring to the patent of Abel Thompson, No. 131,913, where are the ties connecting the track rails in that patent? Please mention them by letter.

—. These ties are shown in the detailed or detached view Fig. 3, and referred to by the letter *h* in all the figures. Figs. 1 and 2 show these "metallic trusses *h*" supporting the track rails *f*, which must be understood as a matter of course and of necessity as fastened securely in place. In Fig. 1 the metallic trusses are partly concealed by the masonry forming the walls of the tunnel.
307 Figure 3, however, elucidates the construction of these metallic trusses and shows that they constitute ties which when in use, as illustrated in Fig. 1, will connect and support the track rails *f*, although these track rails are not shown in Fig. 3. The specification on lines 38, 39, 40 says, "Fig. 3 is an elevation in smaller size of the metal truss supporting the roof of the tunnel." The specification goes on to describe the slot or "longitudinal opening *b* through the roof for the plate, rod, bar, or other connection *c* that passes from the engine *d* to the car *e*." Figure 3 thus shows the mode of connecting track rails which are located on opposite sides of the slot through which a connection extends from the car to the motor. Again, in the 2d column of the specification, I find the following: "It is preferable that metallic trusses *h* be employed at short distances apart, placed transversely to the tunnel as shown, and these are to be proportioned and braced to obtain the required strength, and the longitudinal bars *i*, passing from one truss to the next, connect the same and forms the side of the *the* longitudinal opening." The second claim in this patent is made directly to the transverse ties or yokes which connect the rails or themselves connected by longitudinal bars, and have slots or openings at top to permit the passage of the motor connection. The claim reads as follows: "2. A tunnel made of transverse trusses *h*, open at the upper portion and connected by longitudinal bars *i*, substantially as and for the purposes set forth."

All that portion of the answer commencing "Fig. 2" and thereafter is objected to as incompetent, irresponsive, and inadmissible,

X Q. 74. Please look at the patent No. 249,300, to Casebolt, and state whether the construction of the tunnel is described in any way beyond the description of the "yoke N N," the "angle-iron
308 binding bars E F," "the angle-iron supports I K," and "the flat iron truss bars."

A. The specification describes the parts enumerated in the question in their construction, arrangement, and connection in more full language than that which is quoted. Beyond this the only references I find to the construction of the tunnel, apart from the framework referred to in the question, consists in the statement—lines 26, 27—that the angle irons N N′ have their flat faces toward the tunnel, showing that the interior wall of the tunnel coincides substantially with these bent bars, and the further statement—lines 67 to 70, inclusive—which corroborates this understanding as follows: "In constructing the tunnel for the cable road the edges of the sheet-iron or other sheathing are laid against the exterior of the faces of the angle-iron yokes," and the following statement, lines 71 to 74: "If desired, the lower portion of the tunnel may be given a decided pitch by means of a sheet-metal gutter shown in dotted lines in Fig. 1." This contour of the interior would embed the lower part of the bent bars N N′ in the material of which the tunnel and foundation are formed.

Certified copies of the matters of record in the United States Patent Office referred to in the course of these depositions having now been obtained, the same are hereby offered in evidence, and the notary is requested to mark them respectively—

"Defendant's Exhibit Certified Copy File-Wrapper and Contents Root Patent."

"Defendant's Exhibit Certified Copy Examiner's Decision, Interference, Root *versus* Eppelsheimer."

309 "Defendant's Exhibit Certified Copy Eppelsheimer's Affidavit, Interference, Root *versus* Eppelsheimer."

"Defendant's Exhibit Certified Copy Commissioner's Decision, Interference, Root *versus* Eppelsheimer."

The last three exhibits are objected to by complainant's counsel as incompetent, irrelevant, and immaterial.

The following is a detailed list of exhibits now and heretofore offered in evidence by counsel for defendant:

1. Defendant's Exhibit Eppelsheimer U. S. Patent No. 193,757, J. A. S., ex'r.
2. Defendant's Exhibit Root U. S. Patent No. 246,420, J. A. S., ex'r.
3. Defendant's Exhibit Root U. S. Patent No. 246,210, J. A. S., ex'r.
4. Defendant's Exhibit Root U. S. Patent No. 247,781, J. A. S., ex'r.
5. Defendant's Exhibit Eppelsheimer U. S. Patent No. 224,284, J. A. S., ex'r.
6. Defendant's Exhibit Eppelsheimer Letter No. 1, J. A. S., ex'r.
7. Defendant's Exhibit Eppelsheimer Letter No. 2, J. A. S., ex'r.
8. Defendant's Exhibit Alexander Letter No. 3, J. A. S., ex'r.

9. Defendant's Exhibit Imray English Patent No. 3133 of 1877, P. M., ex'r.

10. Defendant's Exhibit Eppelsheimer English Patent No. 4800 of 1878, P. M., ex'r.

11. Defendant's Exhibit Holt English Patent No. 1581 of 1876, P. M., ex'r.

12. Defendant's Exhibit Galloway English Patent No. 10606, P. M., ex'r.

310 13. Defendant's Exhibit Parkin English Patent No. 11274, P. M., ex'r.

14. Defendant's Exhibit Bruck English Patent No. 1854 of 1853, P. M., ex'r.

15. Defendant's Exhibit Blackburn English Patent No. 1269 of 1854, P. M., ex'r.

16. Defendant's Exhibit Coignet English Patent No. 2757 of 1859, P. M., ex'r.

17. Defendant's Exhibit Doull English Patent No. 3173 of 1865, P. M., ex'r.

18. Defendant's Exhibit Knight U. S. Patent No. 38112, J. A. S., ex'r.

19. Defendant's Exhibit Gouch U. S. Patent No. 161,222, J. A. S., ex'r.

20. Defendant's Exhibit Hallidie U. S. Patent No. 182,663, J. A. S., ex'r.

21. Defendant's Exhibit Spear U. S. Patent No. 101,174, J. A. S., ex'r.

22. Defendant's Exhibit Fowler U. S. Patent No. 28069, J. A. S., ex'r.

23. Defendant's Exhibit Casebolt U. S. Patent No. 249,300, J. A. S., ex'r.

24. Defendant's Exhibit Stimpson U. S. Patent No. 1262, J. A. S., ex'r.

25. Defendant's Exhibit Gardner U. S. Patent No. 19736, P. M., ex'r.

26. Defendant's Exhibit Thompson U. S. Patent No. 131,913, J. A. S., ex'r.

27. Defendant's Exhibit Certified Copy File-Wrapper and Contents Root Patent No. 262,120, P. M., ex'r.

28. Defendant's Exhibit Certified Copy Examiner's Decision, Interference, Root *versus* Eppelsheimer, P. M., ex'r.

311 29. Defendant's Exhibit Certified Copy Eppelsheimer Affidavit, Interference, Root *versus* Eppelsheimer, P. M., ex'r.

30. Defendant's Exhibit Certified Copy Commissioner's Decision, Interference, Root *versus* Eppelsheimer, P. M., ex'r.

OCTAVIUS KNIGHT.

DISTRICT OF COLUMBIA, } *ss*:
*City of Washington,* }

I, Philip Mauro, a notary public within and for the District of Columbia, do hereby certify that the foregoing deposition of Octavius Knight was taken before me on behalf of The Third Avenue

Railroad Company, the defendants in a civil cause in the circuit court of the United States for the southern district of New York, held at New York, in said district, on the equity side of said court, wherein Henry Root is complainant and The Third Avenue Railroad Company is defendant, in an action for infringement of patent; that said depositions were taken by agreement of counsel; that the deposition was, by agreement of counsel, taken down on the typewriter by E. Ashley, the deponent having been first by me duly affirmed according to law; that the deposition was subscribed by the witness in my presence; that the complainant was represented at the taking of said deposition by George J. Harding, Esq., of counsel, and that the defendant was represented by Harry E. Knight, Esq., of counsel; that the testimony was commenced on the 20th of January, 1888, at eleven o'clock a. m., and being adjourned from time to time, by agreement of counsel, was concluded on the 27th of January, 1888, and was by consent delivered to me for sealing up and forwarding to the said court; that I am not of counsel or attorney to either of these parties nor interested in the event
312 of the cause; that the fees for taking said depositions amount to $10, and that the same *is* just and reasonable for the service performed and have been paid me by defendant.

In testimony whereof I have hereunto set my hand and affixed my seal of office, in the city of Washington, in the District of Columbia, this 28th day of May, 1888.

[L. S.] PHILIP MAURO,
*Notary Public.*

Mr. JOHN BOGART, a witness produced on the part of the defendant, being duly sworn, deposes as follows in answer to questions propounded by HERBERT KNIGHT, Esq., of counsel for defendant:

Q. 1. Please state your name, age, residence, and occupation.

A. John Bogart; age, fifty-one years; I reside in New York; I am a civil engineer.

Q. 2. Please state what experience you have had in your profession as civil engineer.

A. A continuous experience of over twenty-five years.

Q. 3. Please state where this experience has been and, briefly, in what service or capacity.

A. Railroad construction in the State of New York; canal construction, mostly connected with the Erie canal; sewerage at several points in the United States; roads and structures connected with the improvement of parks and streets in a number of cities; the construction of bridges, and general engineering, consultation, and advice.

Q. 4. Where are you at present engaged and in what capacity?

A. I am in charge of the erection of the bridge and viaduct over the Harlem valley for the city of New York. I have been
313 deputy State engineer for the State of New York for some time, and have just been elected State engineer.

Q. 5. Have you read and do you understand United States letters patent No. 262,126, granted August 1st, 1882, to Henry Root, of San

Francisco, California, for an improvement in the construction of cable railways? If yea, please state briefly or in general terms the nature of the construction of the road-bed, track, and cable tube or tunnel therein described.

A. It is a tube, track, and slot iron tied together by iron and embedded and partially filled in with concrete, the pavement resting upon the concrete.

Q. 6. Now, Mr. Bogart, please state whether, in the course of your engineering experience, you have had occasion to deal with concrete in the construction of railroad or other road foundations or in the construction of subterranean conduits of any kind.

A. I have.

Q. 7. Please tell us briefly to what extent and for what purposes you have been thus engaged in the use of concrete, practically, or have had opportunity to observe its behavior or the practical result of its use.

A. In the foundation for the abutments and piers of railway bridges and culverts; in the foundations for the pavement of roadways; in the construction of street sidewalks; in the foundations and interiors of masses of masonry; in the construction of a bridge entirely of concrete; in sewer-work; in the foundation of the pavement of permanent fortifications, and in the foundation of canal locks and other structures.

Q. 8. From your knowledge and practical observation of the nature and behavior of concrete, what length of time, in your judgment, would be necessary to determine in actual use the practical success of such a construction of cable-railway foundation and conduit composed of concrete combined with iron ribs or yokes to connect
314 and support the track rails and slot irons, as described by the patent of Mr. Henry Root, No. 262,126? In answering this question please take into account the state of the art as known to engineers ten years ago, and give reasons for any opinion you may express.

A. An important element in the determination as to the value of such a conduit is the condition and character which the concrete would have. The time taken by concrete to acquire great solidity varies somewhat with the character of the cement used in its construction, some being quick-setting and some slow. The slow-setting cements acquire a very large proportion of their ultimate strength within the period of one month. I consider that within the period of six months, at the longest, a positive conclusion could be arrived at as to whether the structure referred to would or would not be suitable for the purpose for which it was constructed. While it is probably true that cement, and the mortar made with cement, continues to increase slightly in hardness for an indefinite number of years, yet extended experiments and observations shew that they acquire quite nearly their ultimate strength within a period ranging from one month to six months. The knowledge — the action of concrete and of the time taken by it to become strong has been possessed by civil engineers for many years, and unless in a particular case there were some peculiar and unprecedented stresses

to which the concrete would be liable, I think a reliable judgment could be formed by an experienced engineer as to the probable durability and effectiveness of concrete in a given position.

Q. 9. What do you know as to the use of concrete as a foundation for street pavements?

A. I know it has been used successfully for this purpose in a number of cities. I have seen it so used in London, in Paris, in New York, in New Orleans. For instance, the pavement of
315 Broadway in New York, which was laid many years ago, and the surface of which was large-sized square granite blocks, was laid upon a concrete foundation; this foundation was stable and excellent. The objection to the pavement was that the surface became slippery, and that there were not sufficient joints to afford a foothold for the horse-shoe. *I*t saw that concrete exposed and broken into at various points, and it was in good condition, although it had been subject to the blows and shocks arising from the traffic of Broadway, which traffic came upon the pavement directly after its construction.

Q. 10. Please state for identification the name by which this Broadway pavement to which you have referred in your last answer was commonly known and the period of its use, as nearly as you can remember.

A. I think it was called the Russ pavement. I cannot give at this moment the date of its construction, but I know it was many years ago, and that it was in use for quite a long period; certainly prior to 1875.

Q. 11. Now, Mr. Bogart, from your knowledge and experience as an engineer familiar with the use and behavior of concrete, please state to the court whether of the two, the practical test in the Russ pavement of Broadway, New York, referred to in your last answer, or a cable railway constructed in accordance with Mr. Root's patent, No. 262,126, would constitute a more severe trial of the concrete as to its tenacity and strength?

A. I think that the Broadway pavement would be the more severe trial.

Q. 12. Then, Mr. Bogart, after the concrete foundation and cable tube described in Mr. Root's patent referred to had been in use as a cable railway three or six months, by which time you say the concrete would have acquired a very large proportion of its ultimate strength, would or would not an engineer have any reason
316 to apprehend the disintegration or failure of such concrete foundation in the subsequent use of the road?

A. If it were then in good condition I do not think that an engineer would have any reason to apprehend its disintegration or failure. If it were not in good condition it would never become so.

Q. 13. In constructing railroads with concrete foundations, how soon after the concrete is laid do you in practice venture to run heavy rolling stock over the road in transporting construction materials, for example? I refer to such concrete foundations as are commonly used on railroads at culverts, bridges, or other points.

A. Within one month.

Q. 14. What do you know as to the length of time after the laying of the concrete cableway on the Tenth-avenue road before heavy rolling stock was run over it?

A. I know that it was but a short time.

Q. 15. Has it or has it not been customary with engineers to construct sewers or other underground conduits of concrete for more than ten or twelve years past?

A. It has been customary to construct sewers or other underground conduits with concrete for more than ten or twelve years last past; in fact, for more than twenty-five years. I don't know that I care to get into ancient history, but concrete was used in ancient Rome for such purposes.

Direct examination closed.

Cross-examination by B. K. HARDING, Esq.:

X Q. 16. I presume that you have had more experience in the use of concrete than ordinarily falls to the lot of a civil engineer. Am I right?

A. I have had an extended experience during which I
317 have had frequently to deal with concrete. There are probably many engineers who have not had this special experience.

X Q. 17. Is concrete commonly used as a foundation for railroads? By foundation I mean that part of the structure upon which the ties and rails directly rest.

A. It is not commonly so used.

X Q. 18. What is the ordinary foundation for railroads?

A. What is technically called ballast, which is broken stone or gravel or some other material of the same general nature.

X Q. 19. In constructing sewers from concrete are not the sides continuous and without ribs of metal or equivalent material?

A. Yes, sir.

X Q. 20. Might not a civil engineer of fair ability be ignorant of the length of time necessary to determine the practical success of any structure of concrete?

A. He might if he had not either had experience in the use of concrete or if he had not read the works in which such experience is described.

X Q. 21. Might not a man have sufficient engineering ability to lay tram roads, and yet be ignorant or imperfectly informed as to the length of time necessary to test a structure of concrete?

A. I suppose that he might.

X Q. 22. Suppose concrete put to some new use in construction or used in a structure subject to peculiar conditions, is it your opinion that an engineer should in all cases be satisfied with the test of from three to six months?

A. I find it difficult to answer positively this question, because while I think that as far as the concrete is concerned it will have assumed substantially its permanent condition within that period, yet, it is possible that peculiar conditions might exist rendering a longer experiment advisable.

318 X Q. 23. In your answer to question 8 you say, "and unless in a particular case there were some peculiar and unprecedented stresses to which the concrete would be liable, I think a reliable judgment could be formed by an experienced engineer as to the probable durability and effectiveness of concrete in a given position." Are you of the opinion that no experienced engineer would consider the case shown in letter- patent No. 262,126 such a peculiar case as to justify unusual tests before being satisfied that the structure was a practical success?

A. I think that, as far as the concrete portion of the structure is concerned, the test extending over six months would enable an experienced engineer to judge decidedly as to that part of the structure. As to the whole combined structure and its adaptability to the purpose intended, I am hardly prepared to give an opinion.

X Q. 24. Do you consider that if some solid material were put in instead of the concrete where it appears in the patent a test of six months would be sufficient for any material?

A. That would depend upon the material. For some materials I consider a test of six months would be ample. For others I think a longer test would be desirable.

X Q. 25. Suppose wood were used, and at the end of six months it were in good condition, would you be satisfied with the test of six months?

A. No, sir.

X Q. 26. Will you please give your reason for considering a test of six months sufficient for concrete, but not sufficient for wood—of course, supposing them both to be, at the end of six months, in good condition?

A. Because at the expiration of six months from its manufacture concrete will have attained substantially the condition which experience shows to be practically permanent, while wood would be liable to deterioration, although it might be in good condition at the end of six months.

319 X Q. 27. I suppose there are stones which, if placed in sections where the concrete appears in the patent, would appear in good condition at the end of six months and yet not stand a wear of many years?

A. I think that is probably so.

X Q. 28. Do I understand from your previous answers that concrete, when set thoroughly, is an exceptionally permanent material, or that at the end of six months it would be as permanent as it will ever be?

A. If properly made, concrete is an exceptionally permanent material. At the end of six months it will be in a condition enabling a judgment to be formed as to the probability of its being of a permanent character.

X Q. 29. If not properly made, might it not appear, at the end of six months, to an engineer of small practical experience with concrete as being in good condition, and yet not prove after the lapse of, say, two or three years to be permanent?

A. I think that, if not properly made, it would develop its bad

character within six months sufficiently to secure its condemnation by any civil engineer who should make the proper examination.

X Q. 30. Could concrete be properly made to stand one strain and yet not be properly made to stand some other strain to which it was not intended to subject it?

A. Concrete can be made of different, varying strength. Concrete could be made which could stand certain strains and not stand other certain strains.

X Q. 31. Supposing one in the habit of making structures of concrete to stand certain strains should make a structure of this concrete and subject it to certain other strains, would you say that, in all cases, it could be determined by one not an expert, at the end of six months, whether the structure would stand the last-mentioned strains?

320 A. No, sir.

X Q. 32. Then a man might be justified in having doubts, at the end of six months, as to the permanency of a concrete structure which had been subjected to strains which he regarded as unusual for concrete so made to be subjected to?

A. Not unless it was liable to be subjected to greater strains.

X Q. 33. The substratum of concrete in the Russ pavements referred to in your direct examination was solid, was it not?

A. Yes, sir.

X Q. 34. The pressure upon this Russ pavement concrete was all from the top, was it not—that is to say, the pressure was vertical and there was no lateral pressure?

A. It was substantially vertical.

X Q. 35. You say in your answer to question 11 that the Russ Broadway pavement had a more severe trial than the concrete conduit shown in the Root patent, 262,126. Will you please give your reasons for this opinion?

A. I think that the concussions and shocks coming upon a pavement under a traffic such as exists upon Broadway, New York, are of a more trying nature to a material like concrete than the rolling loads which I suppose would create the strains upon the concrete in the cable conduit.

X Q. 36. Supposing the conduit as it appears in the patent to have been laid on Broadway, where the Russ pavement was laid, would it not, for obvious reasons, from an inspection of the drawing of the patent, be subjected to a more severe test than was the Russ pavement?

A. I do not quite see that such obvious reasons exist. The conduit seems to be a continuous monolith for the width of the construction, while the ties and braces seem well adapted to hold the rails and slot irons in rigid position. The iron ribs are not continuous, but are embedded in the concrete at fixed distances

321 apart. I do not see that there would be much difference, if any, in the shocks received by a concrete base for a continuous pavement in Broadway and by the concrete conduit described in the patent, if placed in Broadway.

X Q. 37. Going back for a moment, I understand you do not consider that the Russ Broadway pavement and a cable railway constructed in accordance with Mr. Root's patent would have the same tests of strength—that is to say, in answering question 11 you took it for granted that the Broadway pavement had the more severe test of strength, or, in other words, that the conditions of the two were not similar?

A. That was in my mind in answering question 11.

X Q. 38. Is there not a lateral pressure in the case shown in the patent communicated from the rails and slot irons by means of the rods and ribs, but more especially the rods, in addition to the vertical pressure on the concrete?

A. I think there is.

X Q. 39. Is not this lateral pressure greater than the lateral pressure in the Russ pavement, supposing the Russ pavement to be arched?

A. I think it is greater.

X Q. 40. Then why is not this cable-railway conduit subjected to a more severe trial, the conditions being exactly similar as to traffic, &c., than the Russ pavement?

A. Under the same conditions of traffic I think it quite possible that the lateral pressure above referred to would be greater in the conduit than in the Russ pavement, and that in that respect the concrete would be subject to a more severe trial. The vertical pressure would be the same.

X Q. 41. In question 13 what do you understand "railroads with concrete foundations" to mean?

A. I understood the question to refer to concrete used at culverts, bridges, or other points where concrete is used in railroad construction.

322 X Q. 42. Is that the ordinary meaning of "foundation of a railroad"?

A. It is not a term that is ordinarily used.

X Q. 43. Do you think, then, the term "railroads with concrete foundations" an indefinite enough term to include anything under a railway track from the concrete used at the bottom of a river to a concrete tie immediately under the rail?

A. Yes, sir.

X Q. 44. When was the concrete cable railway referred to in question 14 laid?

A. I don't know.

X Q. 45. Was it since August, 1882?

A. I think it was.

X Q. 46. Were conduits of such a shape as those shown in the drawing of the letters patent No. 262,126 constructed prior to 1879, to your knowledge?

A. I do not know.

X Q. 47. Were the conduits of this or similar shape constructed with metal ribs prior to 1879, to your knowledge?

A. I do not know.

X Q. 48. Were conduits of this or similar shape, with a nar-

row longitudinal opening in the top, constructed prior to 1879, to your knowledge?

This line of questions is objected to by defendant's counsel as not proper cross-examination.

A. I cannot say as to the date.

X Q. 49. Did you ever know prior to 1879 of a railway track resting directly upon a concrete support or foundation?

A. I don't recall any.

Counsel for defendant here states that the objection here noted refers to cross-questions 46 to 49, inclusive.

323 X Q. 50. In your answer to question 12 you say, "If it were then in good condition," &c., and in your answer to question 8 you say, "I think a reliable judgment could be formed by an experienced engineer as to the probable durability and effectiveness of concrete in a given position." Can you reconcile these two answers in any other way than by assuming that in this particular case (that is, the case of the Root conduit shown in letters patent 262,126) "there was some peculiar and unprecedented stresses to which the concrete would be liable"?

A. I can't see the inconsistency of the two replies, because the one refers to the judgment of an expert in advance of construction and the other to a judgment based upon an examination after construction.

X Q. 51. If an engineer, who in ordinary cases was able to tell before construction as to whether concrete would stand a certain strain, were to make a structure of concrete with the intention that it should stand peculiar and unprecedented stresses, could he be absolutely certain at the end of six months that the structure would stand the peculiar stresses?

A. Not unless those peculiar stresses had been already sustained by that structure; and in case such stresses had been sustained by that structure I think he could form a reliable judgment, but possibly not an absolute certainty.

X Q. 52. Is — not a possibility that this Root conduit might have been laid in some street where the traffic was light beyond the cars passing on the rails and have proved successful for six months and to be in good condition at the end of that time, and then if the street were used for heavy traffic prove a failure?

A. I think it is quite possible.

X Q. 53. Would you say the same as in your answer to
324 question 12 you say of concrete about every other material that might be used in the same place?

A. No; I would not say the same about every other material.

Cross-examination closed, provided that if George J. Harding, Esq., of counsel for complainant, notify the counsel for defendant before Tuesday, December 13th, 1887, that he desires to further cross-examine this witness he may do so at such time as may be agreed upon by counsel.

Redirect by OCTAVIUS KNIGHT, Esq.:

R. D. Q. 54. In referring, in answer to cross-question 52, to the possibility of the Root conduit standing with light traffic for six months and afterward giving way under heavier traffic, please state what possibility you have in mind.

A. I had in mind the possibility of poor material having been used in construction, so that the light traffic referred to might have been sustained and the heavier traffic not have been sustained.

JOHN BOGART.

Sworn before me—
JOHN A. SHIELDS,
*Examiner, &c.*

325 At a stated term of the circuit court of the United States of America for the southern district of New York, in the second circuit, held at the United States court-rooms, in the city of New York, on Tuesday, the 11th day of December, in the year of our Lord one thousand eight hundred and eighty-eight.

Present: The Honorable William J. Wallace, circuit judge.

HENRY ROOT
*vs.*
THIRD AVENUE RAILROAD COMPANY.

The above-entitled cause coming on for final hearing upon pleadings and proofs—

Mr. George Harding is heard in behalf of the complainant.

Court adjourned to Dec. 12th, 1888.

326 At a stated term of the circuit court of the United States of America for the southern district of New York, in the second circuit, held at the United States court-rooms, in the city of New York, on Wednesday, the 12th day of December, in the year of our Lord one thousand eight hundred and eighty-eight.

Present: The Honorable William J. Wallace, circuit judge.

HENRY ROOT
*vs.*
THIRD AVENUE RAILROAD COMPANY.

This cause being still on argument, Mr. Charles G. Coe is heard in behalf of the defendant.

Mr. Harding concludes his argument in behalf of the complainant.

*C. A. V.*

327 United States Circuit Court, Southern District of New York.

ROOT
*vs.*
THIRD AVENUE RAILROAD COMPANY.

WALLACE, *J.*:

The complainant sues for infringement of letters patent granted to him August 1, 1882 (No. 262,162), for an "improvement in the construction of cable railroads." His application for the patent was filed September 3, 1881.

The California-street railroad, a cable railway in the city of San Francisco, was built by the patentee, completed, and went into regular operation prior to April 11, 1878, and as constructed embodied the invention described in the patent in suit. The defendants insist that this is a public use of the patented invention more than two years prior to the patentee's application for his patent, and consequently invalidates the patent. The complainant contends that this was an experimental use of the invention, and that the application was filed within two years after the patentee became satisfied that his invention was a practical success.

It is conceded that the road as built embodied the inven-
328 tion of the patent; that Mr. Root had complete charge of the construction of the road and built it for the projectors, and that it has been operated ever since April, 1878, as built, without any changes or modifications in plan or details. The evidence is that in the early part of 1876 the projectors obtained a franchise to lay and operate a cable railway in California street, one of the public thoroughfares of the city of San Francisco. In the expectation of being employed as the consulting engineer to build the road the complainant investigated the subject of cable roads and matured the invention in controversy between May and September, 1876. In. September, 1876, he disclosed the invention to the projectors, between that time and January, 1877, made a model of it, and in February, 1877, laid down an experimental section of the cable railway embodying the invention in the yard of the Central Pacific Railway Company in San Francisco. His invention was adopted by the projectors, and work was commenced upon the structure in July, 1877. The road cost, with the equipment, $418,000. It was about two miles in length, and the road-bed and tunnel construction cost about $225,000. From April 9, 1878, the structure has been in regular, successful use as a street railway, carrying passengers for pay. Up to the time when the complainant made application for the patent in suit and until 1883 the complainant was superintendent of the road for the owners. In explanation of his delay in making the application for the patent the complainant testifies that he did not wish to patent the invention if the structure proved weak or undesirable, and he did not feel sufficiently certain of its
329 durability and general practicability until the year 1881; that there was no way but by trial in a public street, through a long period of time, to determine to what extent the

moving of cars and the street traffic over a rail connected to iron-work without the intervention of any wood would effect the durability of the structure or to what extent changes of temperature and the effect of water and rust would tend to separate the iron-work from the concrete in which it was imbedded; that while he believed there was more than even chance of its proving a durable and desirable structure he had some doubts in his own mind and was influenced also by the doubts expressed by others in whose judgment he had confidence. He admits that he never expressed these doubts to the projectors, either while discussing with them the features of his invention or while the road was being built or while he remained its superintendent and after it was completed. In answer to a question whether he had any doubts of the durability of the structure after the road was completed he states that in the spring of 1879, while making an extension of the railway, some parts of the structure were exposed, and he then saw some indications of the loosening of the yokes in the concrete and "had some little fear at that time" that trouble might arise in that respect.

Manifestly the complainant received a consideration for devising and consenting to the use of an invention which was designed to be a complete permanent structure, which was to cost a large
330 sum of money, and which he knew would not meet the expectation of those who had employed him unless it should prove to be in all respects a practically operative and reasonably durable one. If he had entertained any serious doubts of its adequacy for the purpose for which it was intended it would seem that he would not have recommended it in view of the considerable sum it was to cost. At all events he did not treat it as an experimental thing, but allowed it to be appropriated as a complete and perfect invention fit to be used practically and just as it was until it should wear out or until it should demonstrate its own unsuitableness. He turned it over to the owners without reserving any future control over it, and, knowing that except as a subordinate he would not be permitted to make any changes in it by way of experiment and at the time he had no present expectation of making any material changes in it, he never made or suggested a change in it after it went into use, and never made an examination with a view of seeing whether it was defective or could be improved in any particular.

In Smith & Griggs Manufacturing Co. *v.* Sprague (123 U. S., 249) it was held that when it is clearly established that there was a public use of the invention by the inventor for more then two years prior to his application for a patent for it the burden is on him to show by convincing proof that the use was not a public use in the sense of the statute, but that it was for the purpose of perfecting an incomplete invention by tests and experiments; and in defining the distinction between a public and an experimental use the court in
331 that case used the following language: "A use by the inventor for the purpose of testing the machine, in order by experiment to devise additional means for perfecting the success of its operation, is admissible; and where as an incident to such use the product of its operation is disposed of by sale such profit from

its use does not change its character, but where its use is mainly for the purposes of trade and profit and the experiment is merely incidental to that the principal and not the incident must give character to the use. The thing implied as excepted out of the prohibition of the statute is a use which may be properly characterized as substantially for the purposes of experiment. Where the substantial use is not for that purpose, but is otherwise public and for more than two years prior to the application, it comes within the prohibition."

Tested by the rule thus stated, the proofs do not show a use substantially for experiment, but show such a public use of the invention as must defeat the patent. The facts are in marked contrast with those in the case of Elizabeth *vs.* Pavement Co., 97 U. S., 126. There the use was solely for experiment. In the language of the opinion in that case, "Nicholson wished to experiment on his pavement. He believed it to be a good thing, but he was not sure, and the only mode in which he could test it was to place a specimen of it in a public roadway. He did this at his own expense and with the consent of the owners of the road. He wanted to know
whether his pavement would stand and whether it would
332 resist decay. Its character for durability could not be ascertained without its being subjected to use for a considerable time. He subjected it to such use, in good faith, for the simple purpose of ascertaining whether it was what he claimed it to be."

A decree is ordered dismissing the bill with costs.

(Endorsed:) United States circuit court, southern dist. of N. Y. Root *v.* Third Avenue Railroad Co. Opinion, Wallace, J. U. S. circuit court. Filed Feb. 5, 1889. John A. Shields, clerk.

333 At a stated term of the United States circuit court for the southern district of New York, held at the city of New York on the 12th day of December, 1888.

Present: Hon. William J. Wallace.

HENRY ROOT, Complainant,
*v.*
THIRD AVENUE RAILROAD COMPANY, Defendant. } No. 3866. In Equity.

This cause coming on to be heard at final hearing on the bill of complaint, the answer and the replication thereto, and on the proofs, testimony, and exhibits taken and introduced on the part of the complainant and defendant respectively, all of which pleadings, proofs, testimony, and exhibits were duly filed, and after hearing George Harding, of counsel for the complainant, on the part of the complainant, and Charles G. Coe, of counsel for the defendant, on the part of the defendant, and the court having considered said above-mentioned record and arguments:

Now, on motion of defendant's solicitors and counsel—

334 It is hereby ordered, adjudged, and decreed that the bill of complaint herein be, and the same is hereby, dismissed with

costs to the defendant, taxed by the clerk in the amount of six hundred and eighteen dollars and fifty-seven cents ($618.57).

WM. J. WALLACE.

Form of above decree approved.

G. J. HARDING,
GEORGE HARDING,
*Counsel for Compl't.*
FROST & COE,
HARRY E. KNIGHT,
*Counsel for Defendant.*

(Endorsed:) U. S. circuit court, southern district of New York. Henry Root ag'st Third Avenue Railroad Company. Decree dismissing bill of complaint. U. S. circuit court. Filed Feb. 18, 1889. John A. Shields, clerk.

335 United States Circuit Court, Southern District of New York.

HENRY ROOT, Complainant,
*vs.*
THIRD AVENUE RAILROAD COMPANY, Defendant.

Upon the consent hereto annexed it is ordered that "Exhibit Book A" and "Exhibit Book B," filed in this suit, be removed and forwarded with the record to the clerk of the Supreme Court of the United States, the same to be returned to the files of this court after this suit has been disposed of in the Supreme Court.

E. HENRY LACOMBE.

We hereby consent to the entry of the above order.

GEO. HARDING, *Sol'r for Compl't.*
LAUTERBACH & SPRINGARN,
HARRY E. KNIGHT,
*Solicitors & Counsel for Defendant.*

(Endorsed:) U. S. circuit c't, S. D. of N. Y. Henry Root *vs.* Third Ave. R. R. Co. Order. George Harding, attorney for plaintiff. U. S. circuit court. Filed April 27, 1889. John A. Shields, clerk.

336 United States Circuit Court, Southern District of New York.

HENRY ROOT
*v.*
THIRD AVENUE RAILROAD COMPANY. } In Equity. 3866.

We hereby consent that the foregoing papers shall constitute the record to be sent by the clerk of the United States circuit court for the southern district of New York to the clerk of the United

States Supreme Court on the appeal to said Supreme Court in the above-entitled cause.

Dated New York, May 4, 1889.

LAUTERBACH & SPRINGARN,
*Solicitors of Record.*
H. E. KNIGHT, *Of Counsel.*
GEORGE HARDING, *Sol'r for Compl't.*

(Endorsed:) U. S. circuit court. Filed May 6, 1889. John A. Shields, clerk.

337 Circuit Court of the United States of America for the Southern District of New York, in the Second Circuit.

HENRY ROOT
*vs.*
THIRD AVENUE RAILROAD COMPANY. } Bond for Costs.

Know all men by these presents that I, Charles R. Parsons, am held and firmly bound unto the above-named Third Avenue Railroad Company in the sum of two hundred & fifty ($250.00) dollars, to be paid to the said company; for the payment of which, well and truly to be made, I bind myself, my heirs, executors, and administrators, firmly by these presents.

Sealed with my seal and dated the 28th day of February, in the year of our Lord one thousand eight hundred and eighty-nine.

Whereas the above-named Henry Root has prosecuted an appeal to the Supreme Court of the United States to reverse the decree rendered in the above-entitled suit by the judge of the circuit court of the United States for the southern district of New York:

Now, therefore, the condition of this obligation is such that if the above-named Henry Root shall prosecute his appeal to effect and answer all costs if he fail to make his appeal good, then this obligation shall be void; otherwise the same shall be and remain in full force and virtue.

CHARLES R. PARSONS. [L. S.]

Sealed and delivered and taken and acknowledged this 28 day of February, 1889, before me—
R. G. MONROE.

338 [Endorsed:] In eq. No. 3866. U. S. circuit court, southern district of New York. Henry Root *vs.* Third Avenue Railroad Company. Bond for costs on appeal. We approve the form, sufficiency, & amount of the within bond. Feb'y 28, '89. Lauterbach & Spingarn, att'y- for def't. M'ch 1, '89. E. Henry Lacombe. U. S. circuit court. Filed Mar. 1, 1889. John A. Shields, clerk.

UNITED STATES OF AMERICA,
*Southern District of New York,* } ss:

Charles R. Parsons, being duly sworn, deposes and says that he executed the within instrument; that he is worth the sum of five hundred ($500.00) dollars over and above all his just debts and liabilities.

CHARLES R. PARSONS.

Sworn to this 28th day of Feb., A. D. 1889, before me—
R. G. MONROE,
[SEAL.] *Notary Public, N. Y. Co.*

339 United States Circuit Court, Southern District of New York.

HENRY ROOT
*vs.*
THE THIRD AVENUE RAILROAD COMPANY. } In Equity. No. 3866.

To the honorable the Supreme Court of the United States:

The appeal of Henry Root, complainant and appellant, respectfully showeth—

That on the 12th day of July, 1886, the above-named complainant and appel-ant filed his bill of complaint in the circuit court of the United States for the southern district of New York against the above-named defendant and appellee, to enjoin and restrain the said defendant and appellee from infringing certain letters patent of the United States for improvement in the construction of cable railways in said bill of complaint set forth, and also praying for an account of profits and assessments of damages arising from said infringement; that a subpœna issued out of the said circuit court was duly served upon said defendant and appellee; that the said defendant and appellee filed his answer to said bill of complaint, to which complainant and appellant filed a general replication.

340 That such proceedings were had in the cause that on the — day of February, 1889, a final decree was entered therein in the words and figures following:

"This cause coming on to be heard at final hearing on the bill of complaint, the answer and the replication thereto, and on the proofs, testimony, and exhibits taken and introduced on the part of the complainant and defendant, respectively, all of which pleadings, proofs, testimony, and exhibits were duly filed, and after hearing George Harding, of counsel for the complainant, on the part of the complainant, and Charles G. Coe, of counsel for the defendant, on the part of the defendant, and the court having considered said above-mentioned record and arguments—

"Now, on motion of defendant's solicitors and counsel, it is hereby ordered, adjudged, and decreed that the bill of complaint herein be, and the same is hereby, dismissed with costs to the defendant, taxed by the clerk in the amount of six hundred and eighteen dollars and fifty-seven cents ($618.57)."

That a final judgment was entered on the 21st day of February,

1889, against said complainant and appellant for the sum of six hundred and eighteen and $\frac{57}{100}$ dollars.

Wherefore this appellant appeals from the whole of said decree of said circuit court of the United States, and it prays that this its appeal may be allowed, and that a transcript of the records, pleadings, proceedings, and evidence in the cause, duly authenticated, may be sent to the Supreme Court of the United States without de-
341 lay, and that said Supreme Court may proceed to hear the cause anew, and that the said decree of the circuit court may be reversed or such other decree made as to the Supreme Court shall seem just.

GEORGE HARDING,
*Complainant's Solicitor.*

Foregoing appeal allowed M'ch 1st, 1889.
E. HENRY LACOMBE.

By the Honorable E. Henry Lacombe, one of the judges of the circuit court of the United States for the southern district of New York.

UNITED STATES OF AMERICA, } ss:
*Southern District of New York,* }

Whereas Henry Root has appealed to the Supreme Court of the United States from the decree lately rendered in the circuit court of the United States for the southern district of New York made in favor of you, the said The Third Avenue Railroad Company:

Therefore you are hereby cited to appear before the said Supreme Court at a term thereof to be holden at Washington on the second Monday of October, 1890, to do and receive what may appertain to justice to be done in the premises.

Given under my hand at the city of New York, in the second circuit, on the 1st day of March, 1889.

E. HENRY LACOMBE.

342 (Endorsed:) U. S. circuit c't, S. D. of N. Y. Henry Root *vs.* Third Avenue Railroad Co. Citation & petition. Geo. Harding, sol. for compl't, 901 Walnut St., Philadelphia, Pa. Service admitted M'ch 4th, '89. Lauterbach, Spingarn & Harry E. Knight, def't- sol'rs. U. S. circuit court. Filed Mar. 4th, 1889. John A. Shields, clerk.

343 UNITED STATES OF AMERICA, } ss:
*Southern District of New York,* }

I, John A. Shields, clerk of the circuit court of the United States of America for the southern district of New York, in the second circuit, do hereby certify that the foregoing pages, numbered from one to three hundred and forty-two, inclusive, contain a true and complete transcript of the

Seal of the Circuit Court, South. Dist. New York.

record and proceedings had in said court in the case of Henry Root, complainant & appellant, against The Third Avenue Railroad Company, defendant & appellee, as the same remain of record and on file in said office.

In testimony whereof I have caused the seal of the said court to be hereunto affixed, at the city of New York, in the southern district of New York, in the second circuit, this seventh day of May, in the year of our Lord one thousand eight hundred and eighty-nine, and of the Independence of the said United States the one hundred and thirteenth.

JOHN A. SHIELDS, *Clerk.*

Endorsed on cover: Case No. 13,559. S. New York C. C. U. S. No. 39. Henry Root, appellant, *vs.* The Third Avenue Railroad Company. Filed May 23, 1889.

146 U S 210

Livingston Middleditch Co., 149 to 153 Leonard St. Telephone Cortlandt 257.

Office Supreme Court U. S.
FILED.
OCT 17 1892
JAMES H. McKENNEY,
CLERK.

# Supreme Court of the United States.

HENRY ROOT,
Appellant,

vs.

THIRD AVENUE RAILROAD COMPANY,
Respondent.

Record, Case No. 13,559.

Term No. 39.

## APPELLANT'S BRIEF.

### Statement of the Case.

This is a suit brought by Henry Root against the Third Avenue Railroad Company, of the City of New York, for infringement of Letters Patent granted to and owned by the said Henry Root, the said Letters Patent numbered 262,126, and bearing date August 1, 1882, for an improvement in the construction of cable railways.

The bill is in the usual form, and prays for an injunction and an account. (Record, pp. 1, 2 and 3.

The patent infringed is for an improvement in the construction of cable railways, described as consisting of the "employment of a connecting tie for the rails and supports for the slot-irons, by which both are rigidly supported from the tie and united to each other"; (this construction being employed) "in combination with a substratum of concrete or equivalent material, which will set or solidify and unite the whole into a continuous, rigid structure, no part of which is liable to

be displaced from its relation to the other, and also provides a support for the roadway."

The infringement of this patent charged upon the defendant consists of the use, in the defendant's roads on Tenth avenue and 125th street, in the City of New York, of a construction substantially embodying the plaintiff's invention. (See detailed comparison, answer to Q. 5 on page 11 of Record; also, x Q. 19 to 24, pages 14 and 15 of Record; also, Q. 20, pp. 77–81; also, Respondents' Expert, x Q. 28 and 29, pp. 165 and 166.)

The defendant and respondent formally sets up the following defences:

1. Invalidity of the patent in suit, because of anticipation by others.

2. Invalidity of said patent, because the invention has been "in public and profitable use in the United States for more than two years before the date of the application of Henry Root for the aforesaid letters patent."

3. Non-infringement of the patent in suit by the defendant's structure.

More or less testimony, intended or purporting to be in support of each of these three defences, was introduced and appears in the Record; but only the second defence—that based upon the allegation of "public use" for more than two years before Root's application—seems to have been at all seriously urged or relied upon, and that defence is the only one mentioned or discussed in the opinion filed by the learned Circuit Judge on deciding the case below (see opinion of Mr. Justice Wallace, at page 187 of the Record).

Under date of December 12, 1888, the Circuit Court in the Southern District of New York rendered a decree, which was filed February 18, 1889, "that the bill of complaint herein be, and the same is hereby dismissed with costs to the defendant." (See decree, p. 189 of Record).

From said decree of the Circuit Court, the complainant, Henry Root, has duly appealed to this Court. (See appeal, Record, p. 192).

## Assignment of Errors.

The complainant and appellant respectfully assigns the following errors to the rulings and judgment of the Circuit Court:

1.—In holding that "the proofs do not show a use substantially for experiment, but show such a public use of the invention as must defeat the patent."

2.—In adjudging and decreeing, upon the whole case, "that the bill of complaint herein be dismissed with costs to the defendant."

## POINTS.

### I.

### The invention was not, within the meaning of the statute, "in public use" for more than two years before Root's application for a patent.

As the opinion of Mr. Justice Wallace very clearly shows, this is practically the only question in the case (Record, p. 187): It was because that learned Judge was under the impression that "the proofs do not show a use substantially for experiment, but show such a public use as must defeat the patent," that the Circuit Court made the decree from which this appeal was taken.

In view of the critical importance of this question, we earnestly solicit the careful attention of this Court to the following considerations:

Mr. Hallidie, who has an intimate knowledge of cable railways since 1869, and constructed the Clay Street Railroad, a cable railroad, (Q. 16, Record, page

29,) and is familiar with the construction of the cable railways in San Francisco, (Q. 18, Record, page 29,) states that his opinion at that time of the invention set out in the patent in suit was shown to him, was that it was an untried experiment and that he did not give his consent to its use (Q. 20, Record, page 29,) and that in his opinion it was necessary to make an experiment which might extend over a period of years and at a very considerable outlay to determine its success, (Q. 21, Record, page 29,) and that would be from five to seven years, (Q 22, Record, page 29,) and that at the time the invention was shown to him he and others disapproved of it strongly, (X Q. 45, Record, page 32,) and that concrete had never been used in a cable railway structure before Root spoke to him about it the 2d of September 1876, (X Q. 54, Record, page 32).

Mr. Jackson, called as an expert in structures involving concrete, testifies that he has been in San Francisco, since 1875, (Q. 2, Record, page 23,) and his evidence shows clearly the necessity for a long and continuous experiment for such a construction as it is set out in the patent. His deposition is a short one and therefore can be very easily read as a whole.

Mr. Root testifies that before the construction of the California Street road was begun there was a large number of objections and doubts expressed as to the success of the construction set out in his patent. And that some of those connected with him withdrew on account to the doubt as to its success. Q. 31, 32, 33, 34, Record, pages 41 and 42. Mr. Root in A to Q. 35, 38, Record, page 42, states that at the time he commenced to construct this road, he was in doubt as to the success of the construction set out in his patent, and gives his reasons for his doubts at that time. He also states, what is shown by the evidence in this case, that at the date of his invention there were no cable railways of that character which would give him any data on which to base a conclusion, and that the only way he had of obtaining information was by an actual trial in a constructed road. (A. to Q. 40, Record, page 42.) And even after the road was con-

structed, he was constantly in doubt as to its ultimate success, for in A. to Q. 41 (Record, page 42), he states that he built the extension of that road from Filmore street to Central avenue in 1879 with a wooden conduit, and that while preparing for that construction he saw what he believed to be signs of the yokes loosening from the concrete. He further explains that his reason for not applying earlier for his patent was, that he desired to test the structure thoroughly, as a patent would be of no value if the structure did not endure and act successfully. (Q. 42, Record, page 43). The persons interested with Mr. Root in this experimental road were largely owners of what is known as the Market Street Road in San Francisco, and that in 1876 it was talked about changing this horse road into a cable road, and this was not done until 1882 (Q. 49 to Q. 51, Record, page 47), and Mr. Root says in A. to Q. 54 (Record, page 47), that the reason that road was not changed at that time was, there was doubt in reference to the durability and permanence of the structure such as set out in the Root patent. After the California Street Road was built Root says there was doubt expressed and fear that the iron would work loose in the concrete, and if it did so, there would be no remedy (Q. 54, page 47, Record). If the California Street Road had failed it would have changed the whole plan, and probably have prevented the Market Street Road from being changed to a road of the construction of the California Street Road, as was done in 1882 (Root's evidence, A. 55, Record, page 48). Root states (A. to Q. 57, Record, p. 48) that one of the objects of the California Street Road was to make a trial looking to much larger operations in the future, especially the Market Street Road.

The evidence is thus unquestionable as to the fact Mr. Root intended this road as an experimental one, and that it was not such a structure as at that time could at once have been known to be a satisfactory construction. It was impossible to test this device except by putting it into practical use. The cost of this practical experiment does not enter the question, as it

could not be tested unless a road was actually constructed upon which would be received all the strains due to traffic, etc., by which alone it could be tested. (See Elizabeth *v.* Pavement Co., 7 Otto, 126.)

The respondents have shown in their proof that this patent in suit was involved in an interference. During that interference the question arose which is now taken as defense by respondents, and the Patent Office decided that the use upon the California Street Road was an experimental use and such a use as the nature of the invention required. (Respondent's Exhibit Record, page 109.)

The "use" of Root's invention in the California street railroad, upon which the learned Judge below rested his decision, was not the sort of "public use" intended by the statute, inasmuch as it was not such a use by the public (as distinguished from a use in public) as is obnoxious to the policy of the statute, implying an abandonment or dedication of the invention to the public, and being therefore likely to mislead the public into assuming that the use of the device was free to all.

Save on the unwarrantable assumption that the provision in question is a purely capricious and arbitrary one, it would seem difficult to deny that this enactment should be construed in the light of the policy which inspired it, and which unquestionably amounts to this: That the acts or attitude of the patentee, with reference to his invention, must not have been such as would naturally mislead the general public into a belief that he had finally dedicated or abandoned his invention to the public, and entertained no intention of availing himself of the privileges accorded him by the patent laws.

"It is settled that a merely experimental use, made in good faith, and not in such wise as to amount to a fraud upon the public, MISLEADING them into a use, in the belief that it is free, does not destroy the exclusive right of an inventor."

(Mr. Justice WOODRUFF, in Sisson *v.* Gilbert, 9 Blatch., 185).

"The inventor is not to lie by and let persons manufacture the article for sale AS IF not to be patented BECAUSE he then MISLEADS them."

(Mr. Justice WOODBURY, in Adams *v.* Edwards, 1 Fish Pat. C., 1).

"There is an obvious distinction between a public use, or a use by the public, and an experimental use in public. * * * A use in public for test or experiment is not such a public use as was contemplated by the Act of Congress, nor such a use as can be held evidence of dedication to the public."

(Mr. Justice STRONG, in Locomotive Truck Co. *v.* Penn. R. Co., 1 Bann. and Ard., 470).

As need hardly be said, for the purposes of this question the only "use" of the invention in the California-street road—save in the sense in which it might be said that Root himself was there "using" the device by way of test and experiment—was by the company that owned the road. That that company transported passengers generally, by means of this cable road, does not in any relevant sense constitute those passengers, *i. e.*, "the public," the users of the invention itself, as such. With the instrumentalities employed by the company in the service they have nothing to do: it was not they, but the company, that procured the means actually employed, and provided for their being used in the business of the road. It was the company, and not they, who would have been liable for infringement of Root's invention, had the device been used in violation of his legal rights. It is only in a remote and, in this connection, a wholly irrelevant sense, that the individual customers of a business can be said to be the users of the machinery, plant, or other instrumentalities of the enterprise.

There can thus be no doubt whatever, that the only user of the Root system, (other than Root himself), in the instance relied upon was the corporation which owned and ran the California-street cable road.

Now, under the circumstances which here existed nothing can be clearer than Root's permitting that corporation to use his system as it did, in no sense implied or involved a "public use" of the invention, or such an "action or attitude" upon his part with reference thereto, as could fairly be deemed likely to "mislead" the public into supposing that the invenion had been abandoned and dedicated, and into acting "on the belief that it was free." For Root, as the regularly employed engineer of the company, in full charge of the construction and at least technical management of its road, was far too closely identified with the company, in respect of the use of his invention, to allow his licensing the employment of his system in that instance to bear even the most remote implication that "the public" was "free to use" the improved device he had originated.

To him, under the circumstances, the California street corporation was not "the public," or a part of the public, but, on the contrary, a capitalist-partner by whose aid alone he could experimentally test and develop his conception in the only way in which, in view of the nature and uses of the thing invented, such experimental test and development were practicable, *i. e.*, by the actual use of the device in an actual road actually carrying such passengers as might offer. Root was a young man without means, and wholly unable, from his own resources or on his personal credit, to defray the expenses of constructing and running for an adequate period any such practical embodiment of his idea as could alone, and only by extended trial under all the usual incidents and conditions of actual use, sufficiently test or practically establish the value of the invention. By singular good fortune he happened to secure the confidence and backing of Senator Stanford, and three or four other gentlemen of wealth and enterprise, who were willing to take the financial risks of the experiment proposed, on the practical scale which alone could be adequate or satisfactory. If the plan worked, as they all hoped it would, these capitalists would be repaid partly

by the traffic on the California street road itself, but mainly by the use of the same device on a much larger scale in other similar enterprises, such as the "Market street road" (which cost several times as much as the experimental road, and in which Root embodied his invention for his employers after it had been duly tested in California street. See Record, pp. 48 and 140; answers to Qs. 57 and 59, and x Q. 48). By this arrangement, Root, on his side, was enabled, experimentally, to test his invention as he would not otherwise have been able to do, but as alone such an invention was, in the nature of things, susceptible of being really tested to any practical purpose whatever.

The fact that fares were collected from passengers upon this road (which road we have thus seen to be, in a very relevant and very real sense, an experiment upon the part of both Root and the company) seems to have been the determining circumstance against us in the mind of the learned Judge. He seems to have assumed that that in itself was proof that the "use" of the California street road was not a use "substantially for experiment," but a use "substantially for profit"; and having assumed this he easily concludes that we are not protected by the principle laid down by this learned Court in the Smith & Griggs case (123 U. S., 249), that the receipt of profits is not incompatible with a "substantially experimental" use.

The fact is, of course, that since the principle is that even the regular receipt of profits from the use, will not render the invention unpatentable, provided only that the "use" from which such profits are received is "substantially experimental in character"; the question whether this proviso is complied with in a given case, must be determined by some other (and better) test than that afforded by the receipt of profits.

And we submit that such other and better test can reasonably and upon principle be attempted only by examining the particular case in hand, in the light of the answer to this question:—Whether the "use" indulged in was or was not in fact the sort of use which

an adequate and experimental test and trial of the invention must in fairness be held to involve, in view of the actual specific nature of the thing tested, and of the peculiar conditions under which its subsequent utilization in business would have to proceed, if at all?

If yes, then—we submit—not even the receipt of profits from the "use" during this period of observation, can (in the words of the opinion in the Griggs case) "change the character" of the use (so far, at least as concerns the application of this statute). And if not that circumstance, of the regular receipt of profits, then *a fortiori*, no other circumstance or circumstances whatever, not absolutely inconsistent with and destructive of that affirmative answer to the test question, which the hypothesis assumes. *A fortiori*, we say, because if anything could have a tendency to prove the "use" to have been "for profit," as distinguished from any other aim, it would surely be, par excellence, the circumstance of "profit" being regularly worked for and secured. But that even this most significant and characteristic symptom of all, may—so far from being deemed a necessarily fatal one—be treated as but a legitimate "incident, of a "use" otherwise recognizable as "substantially experimental in character," we have the conclusive authority of this Court to show.

With all respect, we now urge upon this Court the view, that the decision in the Court below resulted from the omission to apply to the circumstances of this case the test already indicated. Noticing the existence of elements or features which are unquestionably characteristic of an actual, present business "exploitation" of Root's invention, and above all, the culmination of the business in "profits,"—the learned Circuit Judge seems to have assumed that this conclusively stamped the "use" as one obnoxious to the statute; thus ignoring the fact that in some cases an adequate trial of the invention involves its embodiment and operation in the manner, and on the scale, which are required and would suffice for an "an actual present business exploitation" of the device, and that, where this is the

case, there is not the slightest objection, in the policy of the statute, to the utilization of the apparatus or plant in a commercial way, pending its experimental operation.

We submit that the present was just such a case. An adequate, effectual trial and testing of Mr. Root's invention practically involved its embodiment and operation inthe manner and on the scale in and on which it was embodied and operated in the California street road; and this being so, and Mr. Root's backers having been willing to risk their capital in the experiment, there was no reason in law or policy why the experiment should not be thus made, or why, when it was so made, the operation of the system, which was required for adequately testing it, should not have been allowed, at the same time, to secure for the investors the return or "profit" which the passengers who happened to be served by the carrying on of the experiment were willing to pay for the accommodation.

That the learned Circuit Judge did not adequately consider what sort of test or trial was appropriate and needful here to establish practically the value of Root's device, is shown by his opinion. He treated what was not even a "working model" as "an experimental section of the cable railway embodying this invention!" This so-called "experimental section of the cable railway" was "a section six or eight feet long of the mode of constructing the tube" (Record, p. 18, Q. 17.) It was not built in the ground at all, but contained in a wooden casing; it had no pulley in place, and no tracks, "cable," or cars at all; it was simply a rough, specimen brick, as it were, of the construction proposed by Root, a piece of the "tube," and not even a piece of a "cable railway." The one and essential virtue of Root's invention being, beyond all question, that his device would, in actual operation, retain all its parts firmly in the proper relation to each other, it being preserved by its rigid "monolythic" construction, and the firm interlocking of all the metal parts, from the danger of the relative misplacement of the rails and the slot through which the grip must run; how could this

purely dynamic utility and efficiency be "experimentally" tested by the dead, unused and unusable piece of concrete tubing in the box "in the yard of the Central Pacific Company in San Francisco." We assert without any fear of contradiction that, in any relevant sense, what the court below relied upon as having obviously dispensed with any further "experimental" tests, was no more capable of experimentally testing or exhibiting the success and utility of Root's device, than are the pieces of sewer-pipe occasionally to be seen lying upon our streets, or even the printed "sections" of Root's construction in the diagrams inserted opposite page 95 of the Record.

The details of the Court's argument, as shown in the opinion below, seem all to ignore completely the fundamental distinction we have pointed out, that where an adequate, practical test of the invention, itself involves the erection and operation of the entire apparatus and plant required for commercial exploitation, the exploitation and the testing may proceed coincidently, without any impeachment of the inventor's right to a patent should the experiment succeed. If this principle is kept in mind, the inconclusiveness of the objections made becomes at once apparent, inasmuch as they are all but items of the immaterial fact that in the California-street road Root's invention was at once practically tested and commercially exploited. Into this category now fall the following assertions: That "the complainant received a consideration"—his salary as managing engineer—"for devising and consenting to the use of his invention" (we say he was paid for his work, and that the free use of his invention, if it worked, was the inducement to the risking of the capital needed to try the experiment). That the "invention was designed to be a complete permanent structure, which was to cost a large sum of money, and which he knew would not meet the expectation of those who had employed him unless"—precisely—"unless it should prove to be in all respects a practically operative and reasonably durable one" (we say, that while it was 'designed' that the

structure should be 'permanent' every one concerned knew that there was no certainty that it would so turn out to be, the construction being an untried one; that the cost would naturally not appear so large to men dealing with a subject necessarily involving large disbursements, as it would to those engaged in other enterprises; the expense was no greater than has often before been risked in experimental ventures—such as the ocean cables, the elevated roads, etc.; and that at any rate the investment, large or small, was certainly made by Senator Stanford and the others simply upon the chance that the experiment would succeed, and was looked upon by them as a preliminary experiment in the light of which to determine what sort of structure to use in their much larger enterprises. Record, pp. 47 and 48, Q. 54 to 62.) That "if he (Root) had entertained any serious doubts of its adequacy he would not have recommended it in view of the considerable sum it was to cost. He did not treat it as an experimental thing, but allowed it to be appropriated," etc.: undoubtedly he had a confidence in the correctness of his plan, theoretically considered, but he and his employers all knew that only a practical test could ascertain its merits, which practical test they were willing to undertake, even at the great cost which has so impressed the Court below. (Record, pp. 41 to 43, questions 31 to 42.) It was not for Root to "treat" the road otherwise than as he did, even had he desired so to do, though as it happens it was "treated" in precisely the manner required to establish practically the value of his invention. As the structure was never his property, it is not clear in what sense he is said to have "allowed its appropriation." That "he turned it over to the owners without reserving any future control over it, and knowing that except as a subordinate he would not be permitted to make any changes in it by way of experiment," etc How could he do otherwise than turn it over to the owners? How could he, as against the owners, have reserved a future control over the property? The making and running of the road itself was the "ex-

periment," and a sufficiently important one, though the Court seems to assume that "experimenting" means an assorted series of "changes" at short intervals. As they had risked their money on his *a priori* theory, he could feel reasonably sure that they would let him make any improvements which experience should suggest; but even if not, what choice had he? With him it was that or nothing. It was only by their help that he could test his plan at all and prove its commercial value. For reasons satisfactory to themselves they were willing to put their money into his scheme; by the aid of their money he was able to test in practice the correctness of his views. Is there anything here inconsistent with the "experimental character" of the California-street road? That "he never made or suggested a change in it after it went into use," is true; but no "change" happened to be called for, the plan having, as he hoped it would, worked well. That "he never made an examination with a view of seeing whether it was defective." (He was an engineer in charge, and though he certainly did not dig up the road at intervals for "examination," he was watching it all the time, and aware all the while that it was working. Record, pp. 40 and 41, Q. 23 to 30).

With all respect to the learned Circuit Judge, we submit that the principles recognized by this court in the Nicholson Pavement case (97 U. S., 126) fully establish the patentability of Root's invention, notwithstanding its embodiment in the California street road. The learned judge indeed asserts that "the facts are in marked contrast" in the two cases; but his own specification of the supposed difference itself shows, on the contrary, the singular and fundamental similarity of the two "uses." Mr. Justice Wallace quotes as follows, to prove his point: "Nicholson wished to experiment on his pavement. He believed it to be a good thing, but he was not sure, and the only mode in which he could test it was to place a specimen of it in a public roadway. He did this at his own expense, and with the consent of the owners of the road. He

wanted to know whether his pavement would stand, and whether it would resist decay. Its character for durability could not be ascertained without its being subjected to use for a considerable time. He subjected it to such, in good faith, for the simple purpose of ascertaining whether it was what he claimed it to be." Now this, we confidently claim, is literally—with the single exception of the words "at his own expense"—a singularly accurate description, *mutatis mutandis*, of the circumstances in the case at bar. The one and only difference—that Nicholson had the pavement put down "at his own expense," whereas Root had to build his system by the aid of Gov. Stanford and other capitalists—this, we submit, has obviously no bearing whatsoever upon the question of the 'experimental character" of the construction. Whether the company should risk its money, and an amount of it which seemed to the Court a large one, on what was known to be a practically untried scheme, was simply the company's own affair, and, as the event has proved, the reward to them, should the experiment prove the value of the invention, was to be substantial in a degree amply compensating for the risk. So clearly was the venture understood to be experimental that one of the original projectors—Mr. Crocker—withdrew at the last moment from his intended participation in it, the chances of success not seeming to him sufficient, in the absence of experience, to justify the investment. It was only after the experiment had succeeded that he joined in the building of other roads upon Root's plan.

"The nature of a street pavement," said this Court in the Nicholson case, "is such that it cannot be experimented upon satisfactorily except on a highway, which is always public. When the subject of invention is a machine, it may be tested and tried in a building, either with or without closed doors. In either case, such use is not a public use, within the meaning of the statute, so long as the inventor is engaged, in good faith, in testing its operations. He may see cause to alter or improve it, or not. His experiments will reveal the fact whether

any or what alterations may be necessary. If durability is one of the qualities to be attained, a long period, perhaps years, may be necessary to enable the inventor to discover whether his purpose is accomplished. And though, during all that period he may not find that any changes are necessary, yet he may be justly said to be using his machine only by way of experiment; and no one would say that such a use, pursued with a bona fide intent of testing the qualities of the machine, would be a public use, within the meaning of the statute. So long as he does not voluntarily allow others to make and use it, and so long as it is not on sale for general use, he keeps the invention under his own control, and does not lose his title to a patent. . . . He may have it put up and used in the premises of another, and the use may insure to the benefit of the owner of the establishment. Still, if used under the surveillance of the inventor, and for the purpose of enabling him to test the machine, and ascertain whether it will answer the purpose intended, and make such alterations and improvements as experience demonstrates to be necessary, it will still be a mere experimental use, and not a public use, within the meaning of the statute."

"Whilst the supposed machine is in such experimental use, the public may be incidentally deriving a benefit from it. If it be a grist mill, or a carding machine, customers from the surrounding country may enjoy the use of it by having their grain made into flour, or their wool into rolls, and still it will not be in public use, within the meaning of the law."

Again: "Did he (Nicholson) do anything more than the inventor of the supposed machine might do, in testing his invention? The public had the incidental use of the invention, it is true; but was the invention in public use, within the meaning of the statute? We think not. The proprietors of the road alone used the invention, and used it at Nicholson's request, by way of experiment. The only way in which they could use it was by allowing the public to pass over the pavement. Had the City of Boston

or other parties, used the invention, by laying down the pavement in other streets and places, with Nicholson's consent and allowance, then indeed the invention itself would have been in public use, within the meaning of the law ; but this was not the case. Nicholson did not sell it. He did not let it (the invention) go beyond his control. He did nothing that indicated any intention so to do. He kept it under his own eyes, and never for a moment abandoned the intent to obtain a patent for it."

As the Court said about the Nicholson case : "IF NOW WE APPLY THE SAME PRINCIPLES TO THIS CASE, THE ANOLOGY WILL BE SEEN AT ONCE."

As to the necessity of complete and public use in experimenting, the cable road is even stronger than the pavement. The latter can be much less in extent than the former. It would not be possible to experiment with any but a complete cable road. A block or two or three blocks would not answer, for it would not be practicable to run cars regularly and constantly over such a short section, the city would not permit such a road nor such an experiment, nor could any one be induced to undertake it. It becomes evident, therefore, that conceding a desire to experiment, a full length, practically operating cable road upon a public highway would be necessary.

It is a reasonable supposition that the use was an experimental one. The learned Judge below seems to have assumed that Root, a poor man, after working hard to perfect this invention, which he rightly believed to be a useful and very largely available one, would, without any particular reason for such abnegation, deliberately decline to accept the emoluments which the patent law would give him. But, surely, it is the reverse of this which may be reasonably presumed. The test by which usefulness is to be determined necesssarily differs widely in the various classes of invention. Frequently, as in the case of articles in ordinary domestic use, it can be established by a mere inspection ; in the case of a machine for the production of any staple article of manufacture, by the fact

that it produces such an article. But there is a large class of cases where the durability of the subject of invention, under certain or unascertained influences or strains, in reality constitutes its usefulness, and in the latter class belong such structures as pavements, railroad beds, &c. These from their nature, can be tried only in public, and any such test must extend over a considerable period of time, to enable the inventor to demonstrate their utility. A pavement might well sustain the stress of public traffic for a year or two, or the road bed support the superstructure of a railroad for a like period ; but if, at the end of two or three years, they should fail through inherent weakness, or wear out, they would be of absolutely no commercial value. Durability, of all qualities, is the *sine qua non* of such structures ; without it they are worthless, and the same criterion should not be applied to them as to a machine for making a staple article, such, for example, as buckles.

This point should be kept in mind, in comparing this case with that of Smith and Griggs (123 U. S., 249).

NOTE. Counsel in this case deem it proper here to note that they have largely availed themselves of the illustrations and research contained in the discussion of these questions in the brief prepared and filed in the case of Pacific Cable Railway Co. against Piedmont Cable Co., by WM. F. BOOTH, ESQ., of the California Bar.

See also the following cases :

Railway Register Co., 26 Fed. Rep., 522.
Beedle *v.* Bennett, 122 U. S., 71.
Innis *v.* Oil City Works, 30 O. G., 998.
Graham *v.* McCormick, 11 Fed. Rep., 859.
(Reversed on another point, 129 U. S., 1.)
Campbell *v.* The Mayor, etc., 9 Fed. Rep., 500.
Sinclair *v.* Backus, 4 Fed. Rep., 539.
Campbell *v.* James, 17 Blatchford, 42.
Locomotive Truck Co., 1 Bann. & Ard., 470.
Birdsell *v.* McDonald, 1 B. & A., 165.
Jones *v.* Seevall, 6 Fish., 343.
Winans *v.* N. Y. & H. R. Co., 4 Fish., 1.

## POINT II.

**The defense of "anticipation" of the invention by others cannot be sustained.**

That this alleged defense was only perfunctorily set up will very clearly appear from a perusal of the case, and Mr. Justice Wallace, in his opinion, altogether ignored it. He, in effect, decided that Root was the real inventor, as the opinion shows. As this Court may, however, prefer to consider the question as *res nova*, we will simply present some of the reasons for which the plea of anticipation should be overruled.

1.—The claim that Eppelsheimer anticipated Root.

Respondent's evidence on this point is, first, that of their witness, Pardy, who testified, answer to question 13 (Record, p. 104), that he met Mr. Eppelsheimer on Montgomery street with a roll of drawings, and that he then described the invention to him. Mr. Hanscom, respondent's witness, testifies that in the latter part of 1876 Mr. Root and Mr. Eppelsheimer came to his place to have some iron work constructed (Q. 5, p. 110, Record); that Mr. Eppelsheimer had a drawing of the form of yoke (Q. 8 *et seq.*, p. 111), and that if he had any opinion on the subject it was that the invention was Mr. Eppelsheimer's (Q. 55, p. 117); but in answer to the fortieth question (p. 115) he says he does not recollect the drawings, and he says repeatedly in his evidence that the only work that was done at his place, the Hope Iron Works, was the iron work. He states (Q. 100, p. 121) that he did not work upon the Eppelsheimer drawings in making the model, and he says repeatedly in his evidence that Mr. Root was the principal in the matter (XQ. 106, 107, p. 122), and that Root gave the orders and paid for the work, and that the work was done for Root (x Q. 114, page 123). This and the evidence of Milliken, respondent's witness, who testified that all that he knew about it was that he saw a model of the device

set out in the patent in suit and that Mr. Root told him that it was Mr. Eppelsheimer's design (Q. 22–24, pp. 137, 138). Mr. Root denies this statement positively. (Q. 63–67, pp. 48, 49).

In answer to this the complainant shows that Mr. Root disclosed his invention to Mr. Benchley on the 17th of August, 1876, and that this invention was known to Mr. Benchley prior to the second day of September, 1876, (Q. 11, p. 37), and was disclosed on the 2d of September, 1876, to Davis, Hallidie and Haley (pp. 19, 45) and known to them as Mr. Root's invention, and that it was known to Mr. Haley before Mr. Eppelsheimer had returned from Germany. Mr. Root testifies (p. 142, x Q. 31) that he never told any one that the invention was the design or invention of Eppelsheimer (See Q. 63–67, p. 49). It therefore seems that the invention of Root has been proved to a time at which Mr. Eppelsheimer was not in this country; and again, that the proof of Mr. Root is direct and unimpeached, while the testimony of Mr. Milliken on that point is denied. The testimony of Mr. Hanscom is simply an impression and should count for nothing, while Mr. Pardy's evidence must have been of a date later than Mr. Root's disclosure, as it was made after the return of Mr. Eppelsheimer from Germany (13 Q., p. 104), which it is proved was after the disclosure by Root of his invention to a number of witnesses. Mr. Benchley testifies that in November, 1876, on his return from the east, Mr. Root met him and asked him to make a cable railroad yoke, and that he instructed the superintendent of the Pacific Rolling Mills to make that yoke (15 Q , p. 37). Root testifies that after the rails were bent at the California Rolling Mills, they were sent to the Hope Iron Works, where the remainder of the iron work was done. Therefore, there is no evidence to bring Mr. Eppelsheimer in until after the model was started, and the Hope Iron Works and Mr. Hanscom were simply to do the remainder of the iron work.

2. The claim that the "Clay street hill extension" road anticipated Root's invention.

This alleged prior use was not set up, nor the names of the witnesses set out in the answer. This would technically bar the supposed objection, even if it were correct in fact. But it is not sustained by the facts, as the record shows.

Both the admission formally made (record, p. 129), and the testimony of respondent's witnesses, show conclusively that the Clay street road failed to embody what is the very essence of Root's invention.

The admission agreed to by both sides reads thus:

"The Clay street hill extension road-bed is constructed with castings which rest on sand, and that the track rails and set-irons are supported by the castings, which also support longitudinal stringers, upon which the surface planking which forms the roadway rests; that the tube is formed of concrete, extending between the castings, and that said tube is open at the top."

That is, we have a series of castings which are set on sand, and "between" these castings extends a tube which is not connected with the castings, and practically nothing more than a series of sectional tubes, made of concrete, which extend between iron brackets.

The difference between this and the Root construction is clearly shown by Mr. Hallidie, who constructed the Clay street road, in his answer to question 24 (page 30):—

"In the Clay street road there are cast iron sections that run across underneath the roadbed supporting the rail and slot iron, and having a broad base of sufficient size to allow it to set securely on a sand or earth foundation, vertical ribs supporting the rail, these sections are about 4½ feet apart, and the casing of the tube through which the rope runs is formed of concrete. In the California street construction, the yokes are made of rolled iron with ties and braces set into a mass of concrete, which supports them, and forms a complete intermixing or connection of the iron and con-

crete. The function of the concrete in the Clay street is to form a tube and protect the rope, and in the California street the concrete is the supporting material."

See also his cross-examination (x Q, 50, 52, 53, Record, p. 32).

See Root's testimony (Q, 43, 45, page 43). In answer to cross-question 100 (page 53) Root points out that in the Clay street road "Sections of that tube might be removed altogether without destroying that structure, or seriously impairing its strength and efficiency."

Mr. Pardy admits (Q. 32, 33 and 36, page 107), that he had no recollection as to how the concrete was in either the California Street road or the Clay Street hill extension. "Exhibit B" he made from hearsay (Q. 34, p. 107). "Exhibit A" he refers to as accurately showing the construction (Q. 31, p. 107).

As to Mr. Hanscom's testimony, see questions 27, 28, 60 and 61, (pp. 113 and 118), also x 130 *et seq.* (p. 125). The essay he used in testifying was written six years after the construction, and later than the date of the patent.

For an expert's comparison of the constructions, see Hunter's testimony (Record, pages 74 to 78).

### 3. Prior Patents Set Up By Respondents.

The respondents have set up a large number of patents prior in date to the Root patent in suit. As Root has proved his invention to a date back of September 2, 1876, the only patents necessary to discuss are those which are prior in date to that time. A careful reading of respondent's evidence will show that it is not contended that the invention set out in the Root patent is found in any of the patents prior in date to September 2, 1876, with the exception of the Thompson patent, 131,913, October 1, 1872. In order that the matter may be clearly understood each patent prior in date to September 2, 1876, will be pointed out and the reference made to the testimony of complainant's expert where these patents are explained with clearness and brevity.

English Patent 1581 of 1876 :

Although this patent was not sealed until the second day of October, 1876, and cannot therefore be used to anticipate the invention of Mr. Root, I refer to the answer to Q. 6, Hunter's evidence, pages 62,63 and 64, Record.

English Patent 10,606 of 1845:

In reply to this patent see Hunter's evidence answer to Q. 7, Record, pages 64 and 65.

English Patent 11,274 of 1846:

In reply to this patent see Hunter's evidence answer to Q. 8, pages 66 and 67, Record.

English Patents No. 1,269, of 1854; 2,757, of 1859; 3,173, of 1865:

In reply to these patents see Hunter's evidence, answer to Q. 9, pages 67, 68 and 69, Record.

U. S. Letters Patent, No. 38,112, April 7, 1863:

In reply to this patent see Hunter's evidence in answer to Q. 10, page 70, Record.

U. S. Letters Patent, No. 161,222, March 23, 1875:

In reply to this patent see Hunter's evidence in answer to Q. 11, page 70, Record.

U. S. Letters Patent, No. 182,663, Sept. 26, 1876:

In reply to this patent, see Hunter's evidence in answer to Q. 12, page 70, Record.

U. S. Letters Patent, No. 101,174, March 22, 1870 :

In reply to this, see answer Q. 13, Hunter's evidence, page 71, Record.

U. S. Letters Patent, No. 28,069, May 1, 1860 :

See Hunter's evidence, answer to Q. 14, page 71, Record.

U. S. Letters Patent, No. 197,376, March 23, 1858:

In reply to this patent see answer to Q. 16, Hunter's evidence, page 72, Record.

Thompson Patent, No. 131,913, October 1, 1872:

The respondent claims that this patent shows an anticipation of the device set out and claimed in the patent in suit. The explanation of the respondent's expert (see in answer to Q. 4, page 159, Record)

is very vague, and consists mainly in conclusions without stating any facts upon which these conclusions are based. If the evidence of Mr. Hunter, explaining this patent (Q. 17, page 72, *et seq.*, Record), be carefully read, it will be seen that the structure described in the Thompson Patent differs widely from that described in the patent in suit.

Thus Mr. Hunter says (speaking of the Thompson Patent):

> "The spaces between the trusses are filled with "isolated walls, *m*, of brick work, and there is no "connection between the successive sections of the "wall upon the side of the tunnel, and from the "construction of the truss shown there are no pro- "jections extending into the said walls. These "walls, *m*, might be separately removed. These "walls simply act as retaining walls for the earth "upon the outside.
>
> "There is no hint in the patent that these "trusses support the rails so as to prevent "them from spreading, nor that such trusses "are embedded in a foundation of concrete, nor "that there is a continuous tube of concrete ex- "tending longitudinally—below the car track and "the whole united into a monolythic structure in "which no part can settle or be displaced rela- "tively to the others."

Root patent No. 246,210, August 23, 1881; 246,420, August 30, 1881; Root patent 247,781, October 4, 1881:

A reading of these patents will show that there is not a word in their specifications which relates to the structure claimed in the patent in suit, and that the drawings are such that from the patents themselves there is nothing to lead a constructor to build in accordance with Root patent in suit.

Upon the point raised by respondents in reference to these patents the following authorities are referred to:

McMillan *et al. v.* Rees *et al.*, 1 Fed. Rep., 722; decided by Judge McKennan in 1880.

Collender *v.* Griffith & Co., 2 Fed. Rep., 206, decided by Judge Blatchford.

McKay, etc. *v.* Dibert, 5 Fed. Rep. Rep., 587; decided by Judge Nixon in 1881.

Graham *v.* Geneva Lake Crawford Manufacturing Co., 11 Fed. Rep., 138; decided by Judge Dyer.

Graham *v.* McCormick *et al.*, 11 Fed., 859; decided by Judge Drummond.

Hatch, et al. *v.* Moffit, 15 Fed. Rep., 252; decided by Judge Lowell in 1883.

Cahn *v.* Wong Town On, 19 Fed. Rep., 424; decided by Judge Sawyer in 1884.

Eastern Paper Bag Co. *v.* Standard Paper Bag Co., 30 Fed. Rep., 64; decided by Judge Colt in 1887.

Holmes Electric Protective Co. *v.* Metropolitan Burglar Alarm Co., 31 Fed. Rep., 462; decided by Judge Wheeler.

The Vulcanic Paving Company *v.* The American Artificial Stone Pavement Co. Ltd., 34 Fed. Rep., 320; decided by Judge McKennan in 1887.

## POINT III.

**The defense of "non-infringement" of the patent in suit by the defendant's structure, cannot be sustained.**

The invention described in the patent in suit has reference to the construction of a slotted conduit and roadway for a cable railway. The patent states:

> "My invention relates to cable railways; and it consists in the employment of a connecting tie for the rails and supports for the slot-irons, by

which both are rigidly supported from the tie and united to each other. In combination with this construction I employ a substratum of concrete or equivalent material, which will set or solidify and unite the whole into a continuous rigid structure, no part of which is liable to be displaced from its relation to the other, and also provide a support for the roadway * * * * * * E is the concrete, in which the ties or frames are embedded at suitable distances to support the rails and slot-irons, which form the top of the tube. This concrete forms a support for the iron work, the bottom and sides of the tube, and a foundation for the paving, F, which fills the space between the rails and slot-iron, thus forming an even and durable roadway, which cannot settle below the level of the rails or slot-irons, or cause a side pressure on the tube, as is the case where the roadway is supported on sand or other independent foundation. As nearly all the weight of the traffic is on the rails, the tendency of the rails to go down is resisted by a deep girder of which the bent tie forms the top and this continous mass of concrete forms the bottom."

The evidence of complainant's expert witness, Hunter, (Q. 4, page 11 of Record) also describes the construction set out in the patent (See also answers to x Q. 19, 20, 21, 22, 23, 24, Record, pp. 14-15).

From this it will be seen that the patent comprehends a cable railway structure bound together in such a manner that it will form with all its parts an integral or monolythic structure. The advantages of such a structure are obvious. An underground cable railway being one in which the rope passes through a tunnel placed beneath the surface of the ground and through the top of this tunnel the grip attached to the car projects, it is essential that the support for the track rails, the tunnel, and the various parts should occupy a fixed relationship with reference to each other so that they

may always be in such a position that the grip will act with certainty.

(Respondent's Structure.)

The respondent's structure is built upon Tenth Avenue and 125th Street, in the City of New York, and is for use in an underground cable railway. The construction of this road is clearly illustrated in Complainant's Exhibit No. 2 (Record, opposite p. 10), and the evidence of Hunter (Q. 3, p. 10 of Record) Mr. Hunter states, after examination of this road, as follows :

> "From this it will be seen that the structure employs connecting ties for the rails and supports for the slot irons, both of which are rigidly supported from the main tie and nailed to each other. In combination with such a structure a substructure of concrete is employed, which will set or solidify and unite the whole into a continuous rigid structure, no part of which is liable to be displaced from its relation to the other."

See also evidence of respondent's expert witness, Knight, (x-Q. 28 and 29; Record, pp. 165–166).

The identity of the respondent's structure with that set out in the patent in suit is shown by the evidence of Hunter (answer to Q. 5, Record, p. 11) :—

> "I have made the comparison called for in the question, and find that the construction of conduit and road-bed used by the Third Avenue Railroad Company, and as illustrated in my drawing, 'Complainant's Exhibit No. 2,' clearly embodies the invention sent out in Complainant's Patent, 'Exhibit No. 1,' and particularly set out in the 1st, 2d, 3d, 6th and 7th claims thereof. My reasons for such opinions are: From the description of the construction of the road-bed and conduit of the Third Avenue Railroad Company, I have shown that it embodies in a cable railway the main tie connecting the rails and the upright supports for the slot-irons in combination with concreted foun-

dations, the whole being combined in the manner and for the purpose set out in complainant's patent, and particularly pointed out in the 1st claim thereof. I have also shown that the track-bed of the Third Avenue Railroad Company employed track-supporting ties, A, uniting the two rails in combination with a concrete foundation, substantially in the manner and for the purpose set out in complainant's patent, and particularly pointed out in the second claim thereof. I have also shown that the two rails G were united by ties A, arranged at intervals apart, and a conduit or tube formed of concrete arranged between the rails and above the ties, were used by the Third Avenue Railroad Company substantially in the manner and for the purpose set out in complainant's patent, and particularly set out in the third claim thereof. I have also shown that the Third Avenue Railroad Company employed a slotted conduit and road-bed composed of rails, slot-irons and connections, supported by a masonry foundation built to form the tube, or a part thereof, the whole being combined in the manner and for the purpose set out in complainant's patent, and particularly pointed out in the sixth claim thereof." "I have also shown that the conduit employed by the Third Avenue Railroad Company, which was adapted to receive the rope or cable was made by concrete, open at the top, and combined with iron rails, substantially in the manner and for the purpose set out in complainant's patent, and particularly pointed out in the seventh claim thereof." "For these reasons I find the construction of road-bed and conduit used by the Third Avenue Railroad Company to embody the invention as described and claimed in complainant's patent, 'Exhibit No. 1.'"

See also Hunter, (x Q. 19 to 24, Record, pp. 14 and 15; also Hunter, Q. 20, Record, pp. 78 to 81).

Also, Respondent's Expert, Knight, (x Q. 28 and 29, Record, pp. 165 and 166).

## IV.

Neither the defence of "anticipation," nor that of "non-infringement," being sustainable on the proof; and the "use in public for more than two years," having been only such as was substantially experimental in kind, we respectfully submit that the decision appealed from was erroneous, and should be reversed.

FREDERIC R. COUDERT,
CHAS. FRED. ADAMS,
of Counsel for Appellant.

146 U.S. 210

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Supreme Court U. S.
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JAMES H. McKENNEY,
CLERK.

# Supreme Court of the United States.

OCTOBER TERM, 1892.

HENRY ROOT,
Appellant,

vs.

THIRD AVENUE RAILROAD COMPANY.

Record Case No. 13,559. Term No. 39.

## APPELLEE'S BRIEF.

### Statement of the Case.

This suit is brought by Henry Root against the Third Avenue Railroad Company for alleged infringement of the first, second, third, sixth and seventh claims of United States Letters Patent No. 262,126, issued to the appellant on the 1st day of August, 1882; the improvement embodied in the letters patent relates to the construction of roadbeds and conduits for cable railways.

The defenses set up by appellee are:

1st. The invalidity of the patent in suit, because of anticipations in prior publications.

2d. Invalidity of said patent, for the reason that the invention had been in public and profitable use in the

United States for more than two years before the date of the application of Root for his patent.

3d. The invalidity of said patent for the reason that the invention, even assuming that it was made by the inventor, was abandoned by him long before he filed his application for patent.

4th. The invalidity of the said patent for the reason that the ideas embodied and claimed in said patent were disclosed to appellant by another party.

5th. Non-infringement of the patent in suit by the respondent.

These defenses were all fully urged at the hearing, but as the defense of public use, as set forth in above second clause, was so overshadowing and complete, the other defenses were not discussed by the learned Judge in his decision invalidating the patent.

The case was heard by Judge WALLACE, Circuit Judge for the Southern District of New York, and his decision (Fed. Rep., Vol. 37, p. 673), in which the patent is held to be invalid by reason of prior public use, appears in Record, page 187. From that decision Henry Root, the complainant, appeals.

## POINTS.

**The alleged invention, as described and claimed in the patent in suit, was void for want of novelty and lack of invention.**

THE INVENTION.

The invention is defined and analyzed by appellee's expert in response to Q. 3, page 147 of Record, and by appellant's expert, page 11 of Record.

This testimony makes it evident that the patentee considered the tying together of the rails and the supporting of the slot-irons by the ribs or yokes in such a manner as to prevent their relative displacement the most important and controlling feature of his invention.

In his specification he refers to this feature four times: first, in the statement of invention; next, in the statement of alleged prior state of the art; again, indirectly in the disclaimer, and finally, expressly, in pointing this feature out as a distinguishing feature of his invention.

On the other hand, appellant's expert endeavors to show that the essence of the Root invention does not consist in the ribs or yokes, which are so constructed as to connect the track rails and support the slot-irons in such a manner as to prevent their relative settling, but the *embedding* the ribs or yokes in a mass of concrete which forms a foundation and support for them, and thus makes the whole structure rigid and continuous, or, as Mr. Hunter, the expert, expresses it, a "monolythic" structure.

In this way, what appears to be from the literal language of the specification a merely incidental and subordinate feature of the improvement, is made its cornerstone. This construction is opposed to the statement of invention in the specification, to the alleged state of the art as therein defined, to the disclaimer of concrete generally as a foundation for like structures, and the statement before the claims as to the prominent and distinguishing feature of the invention.

## Construction of Claims.

Appellee's expert defines the claims of the patent in suit on pages 149–151, inclusive, of Record.

He groups the first and second claims together, the only difference between them being, as he believes, that the first claim calls for a tie which both connected the

two rails of the tracks and has upright supports for the slot-irons, while in the second claim the function of the tie is simply to support the track. In both claims the ties are to be combined with a concrete foundation. This concrete foundation in these claims the expert believes to refer only to the foundation for the paving of roadway. He gives his reasons for this construction more in detail on page 167 of Record.

The third claim covers the connecting ties specifically, refers to their function of supporting the track, and claims them in combination with a tube of concrete.

There is no foundation for the sixth claim. The patentee's specification nowhere describes brick-work or masonry as a part of his invention, and yet appellant in contending that this claim is valid and infringed, really stultifies himself, as in describing the Thompson Patent (see Appellant's Brief, p. 24) he describes exactly the same construction that is set out in Root's sixth claim.

The seventh claim is a broad one, and contains none of the limitations of the other claims: It does not specifically recite the particular construction of the rails and ties as set out in claim three, nor does it include the concrete or masonry "foundation" incorporated in claims one, two and six.

Mr. Hunter, appellant's expert, contends that each of these claims calls for the embedding of the ribs or yokes in a mass of concrete and supporting them on this concrete "foundation."

Whatever difference of opinion there may be as to the construction of the different claims, it is evident that every one of the claims of the patent calls for the ribs or yokes so constructed as to support the slot-irons and connect the rails of the track, so as to prevent their relative settling or displacement.

Whatever the other elements of the respective claims may be, this constitutes an invariable factor common to all of them.

This confirms the statements of the specification, and

makes it plain that when the patent was drawn the patentee looked on this feature of the ribs or yokes as the gist of his invention, and the other features as secondary and subordinate.

### Anticipation and Non-Invention.

Respondent's expert produces, refers to, and explains a number of United States and foreign patents bearing on the state of the art in cable and other railways, and on the use of concrete as foundations generally, but it will be sufficient to refer in detail to but three of these constructions, viz., the patent of Thompson, No. 131,913, dated October 1, 1872 (Respondent's Exhibit 26); patent to Eppelsheimer, No. 193,757, dated July 31, 1877 (Respondent's Exhibit No. 1), and, thirdly, what is called in the Record "The Clay street extension."

This latter was an extension of the Clay street cable railroad of San Francisco, California.

Referring first to the Clay street extension, it is not disputed that the road was built and that it began running for pay in the latter part of 1877—some four years before the patent in suit was applied for (see Record, pp. 130, 137). It is not disputed, either, that the road was practical and successful, and that it has been running ever since that time.

The attempted answer to this on the part of appellant is that this extension of the Clay street road does not embody the Root invention.

The Clay street extension is described by appellant's witness (Hallidie, pp. 30 and 32, and Respondent's expert, p. 155).

### The Latter is in Accord with the Admitted Description, Page 129, Record.

It is admitted by Mr. Hunter, complainant's expert (p. 16 of Record), that the yokes or ties used in the Clay street construction are substantially like those

used by the respondent, and support the slot-irons and rails in substantially the same manner, and it is not denied that they thus support the slot-irons and the rails so as to prevent their relative displacement. The Clay street construction therefore has the essential and distinguishing feature of the patent in suit. In addition, the Clay street yokes are so joined by a concrete tube as to form with the concrete a practically continuous structure, forming a conduit or tube for the cable, and preventing by the structure of the yokes the relative displacement or settling of the slot-irons and rails. It is claimed by the complainant's expert that the Clay street construction does not embody the Root invention, for the two reasons that the concrete tube and iron yoke do not rest on a concrete foundation, and because the sections of concrete are discontinued at each yoke, and commence again on the other side of the yoke, thus making a break in the continuity of the device.

Let us analyze these reasons and see what they amount to. In the patent in suit, Root expressly disclaims the use of concrete as new for foundations, and by his statement that there would be no particular invention in the use of concrete to form a tube between "iron ribs of the well-known construction," which construction he has previously stated to be iron ribs in the form of a tube set at intervals, plainly implies that if the ribs of his new construction were used in connection with the concrete tube such combination would embody his invention. That this was his meaning is fully confirmed by the third claim of the patent, which claims the construction of his specific ties or yokes binding the rails and slot-irons together in combination with a concrete tube. Did or did not the Clay street structure, consisting as it does of a concrete tube and iron ribs or yokes, accomplish in practical and durable manner the result of so tying together the rails of the track and supporting the slot-irons as to prevent their relative settling or displacement, which is the object

and purpose of the Root invention, and which result is accomplished in the defendant's structure. This is answered by the testimony in the case. Hallidie (p. 30, Record), appellant's witness and the engineer of the Clay street road, states that the yokes were made with a sufficiently broad base to stand firmly on a sand or earth foundation, and were placed at intervals of only four and one-half feet apart, being joined by the concrete tubing between them. It is admitted that they tie the rails and support the slot-irons with the design and purpose of preventing their settling or displacement.

The use of the Clay street extension was commenced in 1877, and has been practically operated ever since, and is, therefore, an anticipation of Root's alleged invention, as the latter was not reduced to practice until April, 1878.

There is no evidence that this extension has not in a practical and durable manner supported the slot-irons and connected the track rails so as to prevent their relative settling, and in November, 1887, respondent's expert, who examined the Clay street road, found that after ten years' use "the yokes of the road formed complete and efficient ties connecting the rails and upright supports for the slot-irons," and were in combination with a "tube of concrete extending down to the bottom of the said iron ties, and from the nature of concrete naturally and necessarily cohering with the bed, forming common foundation of said iron ties and concrete tubes" (see Record, pp, 154, 155).

His testimony shows that the statements of Mr. Hunter, appellant's expert, that the Clay-street construction would not accomplish the result aimed at in the Root invention in a practical and durable manner, are founded on theory only, and not on the real facts as disclosed in the testimony.

The respondent, therefore, claims that it was justified in using similar yokes to those used in the Clay street structure, tying together the track rails and supporting

the slot-irons, so as to prevent their relative settling, in and connecting them by concrete tube.

The only difference between the appellant's device, broadly considered, and the Clay street and respondent's structure is that appellant's tube and ties are supported by concrete foundation, while the concrete tube and yokes of the other structures are not so supported, but rest upon a sand or earth foundation. That this is not a patentable difference, but only a question of engineering choice, is seen from the disclaimer in the complainant's patent, the state of the art in the use of concrete, and the admitted fact that the Clay street structure has been practically used for ten years without any complaint that it has not been durable and lasting.

Respondent's expert (see pp. 159–161, inclusive, of Record) compares the structure used by respondent with the Clay street hill structure, and the bearing of such structure on the various claims in suit. To this summary we respectfully call the attention of the Court. In accordance with respondent's expert opinion, we claim that the 7th claim of the patent, which calls substantially for a concrete tube to receive the cable, combined with iron ribs, is anticipated by the Clay street structure. If, as claimed by complainant's expert, there is to be imported into the claim the concrete foundation to support the iron ribs, then in view of the state of the art, especially exhibited by the Clay street structure, defendant was justified in using its construction. With reference to the sixth claim of complainant's patent, if the Court can find anything in the patent which will justify regarding a foundation of concrete as the equivalent of a foundation of masonry, then this claim is substantially anticipated in the Clay street structure; otherwise, the claim has no foundation in the specification of the patent.

With reference to the third claim, if it is to be broadly construed, then it is anticipated by the Clay

street road. If limited to the specific rails and ties, as the claim literally reads, the defendant does not infringe.

With regard to the first and second claims, if the words "concrete foundation" are held to mean the foundation for the roadway or pavement only, as claimed by respondent's expert, the respondent does not infringe.

If, as appellant's expert claims, these words mean a concrete foundation for the ties or whole structure, then the defendant was justified in using its cable road in view of the Clay street structure.

It is contended by appellant's counsel that the Clay street hill construction was not set up in the answer; but this, in point, has no force, in view of the decisions.

> See Brown vs. Hall, 6 Blatch., 405; referred to and approved in Roemer vs. Simon, 95 U. S., 221; see also Webster Loom Co. vs. Higgins, 105 U. S., 580; Zane vs. Soffe, 110 U. S., 200; also Barker vs. Shoots, 20 Blatch., 178.

THOMPSON PATENT.

The pertinency of this patent as an anticipatory device is fully discussed by respondent's expert (p. 159 of Record):

"The principle of connecting the track rails and slot-
"irons rigidly together by means of metallic ties or
"transverse truss-frames in such a manner as to provide
"a tunnel and a slot at the top thereof for the passage
"of a traction device by which cars are drawn along
"the track, is well exemplified in the patent of Abel
"Thompson, No. 131,913, granted October 1, 1872.
"Figure 3 of the drawing of this patent shows the
"metal truss or yoke detached from the masonry, of
"which the continuous walls of the tunnel are formed,
"while figures 1 and 2 represent the mode of combin-
"ing this yoke or truss with the tunnel, and supporting

" the track rails thereon. In view of the state of the " art, it was certainly within the knowledge of engi- " neers at the time this Thompson Patent was issued to " substitute concrete for brickwork in the construction " of the tunnel walls, and also to construct the tunnel " of any preferred size or shape, and hence I am of the " opinion that the structure shown and described in the " Thompson Patent, with the addition of the traction " apparatus which was in use in cable railways, and " published in a number of patents which have been " referred to in evidence before the date of Mr. Root's " invention, and substituting concrete for masonry, " constitute a practical embodiment of the alleged in- " ventions set forth in the 1st, 2d, 3d, 4th, and 7th " claims of the patent in suit, while, as shown in the " drawing and specification, the said Thompson con- " struction appears to embody precisely the device " pointed out in claim 6 of the patent in suit."

EPPELSHEMIER PATENT.

The U. S. Patent of Eppelshemier, No. 193,757 (Respondent's Exhibit No. 1), fully discloses the invention set forth in the claims sued under (see Record, pp. 151–153). This patent was filed and issued before Root's alleged reduction to practice in April, 1878.

## POINT II.

**The patent is invalid because the invention was in public use for considerably more than two years before the application for letters patent was filed.**

## Defense of Public Use.

The evidence of the practical public use of the patented invention in controversy for more than two years prior to Root's application for patent, and with his consent, is clear and undisputed, and forms a distinct and complete defense to this suit. Root's claim as to his invention and its practical use, as gathered from his own statement and that of his corroborating evidence, is as follows:

In the early part of 1876 Governor Stanford of California, and his associates, obtained a franchise to lay and operate a cable railroad in California street, a public thoroughfare in the City of San Francisco. It was intimated to Mr. Root that he was to be employed as the constructing engineer, and, in consequence, he at once began to post himself on the subject of cable roads and the best modes of their construction.

He states that he conceived his invention between May and September, 1876, disclosed it to the projectors of the road on September 2d, 1876, commenced a model of it about December, 1876, which was completed in January, 1877. That a model experimental section of the invention was laid down in the yard of the Central Pacific road in San Francisco in February, 1877. That his invention was adopted by the persons interested in the California street road and work commenced in July 1877. That the road was constructed under his personal direction and superintendence, was completed early in the year 1878, such road embodying the invention in controversy not only substantially, but in exact detail.

That the road so constructed cost, in all, $418,000, the roadbed and tunnel construction costing about $225,000, and was about two miles in length. That it was open for practical operation April 9, 1878, and from that day to this has been in practical successful use, carrying passengers for pay. That Root did not apply for his patent until September 3, 1881, about

three years and five months after his invention commenced to be practically used for the benefit of the public and stockholders of the road.

The application to these undisputed facts of the statute which enacts that two years' public use prior to the application for a patent is fatal to its validity is clear and unmistakable.

The complainant, in answer, attempts to say by his evidence that this use, while a public one, was only experimental, because from the character of the structure it was necessary to allow a long time to elapse in order to test its practicability, and such test, from the nature of the case, must be in public.

Complainant's counsel relies on the decision, Elizabeth vs. Pavement Co., 97 U. S. Reports, page 126.

The invention in the pavement case was a wooden street pavement invented by one Nicholson. In order to ascertain its practicability it was desirable to test it, and for this purpose only, Mr. Nicholson, through the courtesy of friends of his, who in connection with himself owned a toll road in the vicinity of Boston, over which there was a heavy truck and wagon traffic, was permitted to lay a section of his pavement *seventy-five feet in length.* This section of pavement was thus used as an experiment and test for over five years before Nicholson applied for his patent.

In deciding that this experiment was not a bar to the patent, Mr. Justice BRADLEY, who delivered the opinion of the Supreme Court, sets forth the following four tests which must be established in order to make an exception to the statute:

*There must be evidence of an intent not to abandon the invention to the public.*

*There must be full and complete evidence that the use in public was for the sole purpose of experiment, and not an actual public use.*

*The patentee during the period of such use must not allow the invention, or the machine or structure in which it is embodied, to pass from his control.*

*The use must not be for pay in any way.*

AS TO ABANDONMENT.

FIRST. In the Nicholson pavement case the Court found that Nicholson showed his intent by his whole conduct, and especially negatived any idea of abandonment by filing a caveat in the Patent Office, in which he claimed the invention as his own and fully disclosed it.

In the present case there is full and complete evidence of abandonment as shown in the conduct and acts of Root.

On December 12th, 1877, there appeared an article in the San Francisco "Evening Bulletin," signed "One Who Knows," in which the credit of the design and construction of the California street cable road was given to Mr. Root. This was answered by William Eppelheimer in the same paper, under date of December 14th, 1877, who claimed the invention embodied in such road as his own, and stated that he had applied for and obtained a patent for such invention on July 31st, 1877.

These two communications are to be found at pages 133, 134, of Record.

Mr. Root, who was called as a witness for respondent, when asked (Record, p. 134) whether he had any knowledge of these publications, answers in a very guarded way that he has no recollection of seeing these articles, or hearing of them *at that time.* He will not swear positively he did not see them or hear of them, and it is entirely incredible that he did not know of their existence soon after they appeared. The patent of Eppelsheimer is produced in evidence by defendant, and is analyzed by respondent's expert at folio 268 of Record. Eppelsheimer was Root's assistant in the construction of the California street cable road, and Root admits that he knew of the existence of the patent some time after it appeared.

This patent shows clearly and precisely the invention set forth in the Root Patent in suit.

Respondent's expert thus sums up the Eppelsheimer matter at page 152, Record:

"The application of Mr. Root for the patent now in "suit was filed the 3d day of September, 1881, upwards "of three years after the issue of the patent to Eppel- "sheimer, disclosing precisely the same invention. It "is found from an examination of the records of these "two applications, as well as from the testimony "already taken in the preser t case, that Mr. Root "and Mr. Eppelsheimer were both in San Francisco "in 1877, when Mr. Eppelsheimer's patent was taken "out; that they were in conference in regard to this "mode of constructing roadbeds and cable-ways for "street railroads, the drawings for which were made "by Mr. Eppelsheimer; that subsequently, Mr. Eppel- "sheimer having gone abroad, Mr. Root applied for a "patent for the same invention four years later, and "demanded an interference with Eppelsheimer's pat- "ent; that Eppelsheimer failed to receive notice of the "interference, owing to his absence from the country; "that the interference was decided in Root's favor upon "what were in effect *ex parte* proceedings, and that, "when Mr. Eppelsheimer heard of the grant of the "patent to Mr. Root for the invention previously pat- "ented to him, he applied for a rehearing before the "Commissioner of Patents on the ground that he had "no opportunity to be heard or to establish his claim "as the true inventor; but this motion was refused by "the Commissioner upon the ground that both the pat- "ents being actually issued, the Commissioner having "no power to annul a patent, there was then no case "before him upon which he could give relief or take "any effective action."

Eppelsheimer, in his affidavit on motion for a rehearing (see Defendant's Exhibit, Record, 113), says:

"That the said patent (Eppelsheimer's Patent) was known by the said Henry Root to be issued to affiant, and that he, the said Root, never to his, the affiant's, knowledge made any claim to have invented the said in-

vention, as set forth and described in the said beforementioned patent, whilst he, the affiant, was residing in the United States, but that he, the said Root, acknowledged by his words and acts and conduct that he made no claim thereto."

The only excuse Root gives for not applying for the patent in suit before September 3d, 1881, is that he did not want any patent for the structure if it was weak and undesirable (Record, p. 40).

But this wish did not prevent him from making three applications for patents for improvements in cable railways many months before he applied for the patent in suit, resulting in patents, two of which were issued, respectively, August 23d and August 30th, 1881, prior to his application for the patent in suit.

In these patents, the yokes or ribs tying the rails and supporting the slot-irons which Root makes the distinguishing and prominent feature of his invention in suit are clearly shown embedded in concrete or some equivalent material.

Respondent's expert so clearly explains these matters that their bearing on the question of abandonment, prior publication and public use is best shown from his statement of the facts:

" I further find, from an examinatfon of the Patent " Office records, that certain of the features employed in " the construction and operation of the California street " cable railway of San Francisco were shown and de- " scribed, and some of them claimed, in other patents of " Mr. Root of earlier date than that which is now in " suit. For example: Patent No. 246,420, for traction " apparatus for wire-rope railways, which was issued " and published the 30th day of August, 1881, four days " before the filing of the application for the patent in " suit, shows in figure 2 of the drawings a cable tube " or tunnel designated by the letter *B* and precisely like " that which is shown, described and claimed in the " patent in suit. Fig. 1 in the patent in suit is a repro- " duction on a larger scale of the lower part of Fig. 2

" in the earlier patent, No. 246,420. The earlier patent, " No. 246,420, contains no claim to the tunnel, but the " claim is to a gripping device requiring such a tunnel " or a suitable tunnel for its use, and the drawing and " specification constitute a complete and sufficient dis- " closure to one skilled in the art of the precise con- " struction of tunnel subsequently claimed in the pat- " ent in suit, the particular construction of the rail-con- " necting and supporting tie or truss in its relation to " the track rails and the slot-irons being clearly shown, " and concrete as a foundation for railroads and other " roads and for the construction of sewers and other " subterranean passages having been a matter of com- " mon public use and knowledge before the grant of " said Patent No. 246,420.

" A still earlier patent, No. 246,210, granted to Mr. " Root the 23d of August, 1881, fully represents the " construction of bent ties connecting and supporting " the rails and supports for the slot-irons. The claim " in the Patent No. 246,210 is to a depression pulley and " mountings therefor for sustaining the upward press- " ure of the cable in passing to an ascending grade ' in " a railway having a tunnel and traveling cable,' and " the specification contains no reservation of the right " to claim in a separate patent the particular construc- " tion of tunnel shown.

" It is apparent that it would be impossible to carry " into effect the several inventions covered by Patents " Nos. 246,210 and 246,420 respectively, in accordance " with the modes disclosed in said patents and follow- " ing the directions contained in the specifications and " drawings and using a concrete foundation such as " had been in use on the California street cable railway " for upwards of three years, and was previously well " known as a material for railroad foundations, without " carrying into effect the improvements pointed out in " the claims of the patent in suit, etc." (pp. 153, 154, Record).

If the acts and conduct of Root, as evinced by the

facts above set forth, do not show an abandonment of his invention to the public, we do not see how this defense can ever be proved.

Even admitting that Root conceived the invention, a circumstance which we deny, all the circumstances show that Root had no idea of patenting his invention at the time of this conception and subsequent reduction to practice, and that his attempt to reclaim by patent what he had abandoned was a mere afterthought.

SECOND. *It must be shown by affirmative evidence that the use was actually, and in fact, experimental.*

In the Nicholson pavement case there was abundance of such proof.

The road on which the pavement was put down, while public in one sense, was a toll-road owned by a corporation in which Nicholson was a stockholder and the treasurer. The section of pavement was only seventy-five feet in length and was put down at his own expense.

It was placed at or near the toll-gate where the heavy trucks and wagons were accustomed to stop to pay toll, and where, in starting, the pavement would be subjected to the severest test. Mr. Nicholson, after the pavement was put down, by his frequent visits to the place, by his conversations and general conduct, showed that the section of pavement was merely experimental, and had no other design or purpose.

In the present suit there is not the slightest evidence of this character. Root built the road for other persons and received his price for building it. The road cost $418,000, not a cent of which he contributed. It commenced to be run for pay at the start, and has so continued to run.

Of course, it would not do for the complainant to allow such facts as these, showing conclusive public use, to go to the court without an attempt to negative or diminish their force.

Such an attempt is found in the *opinion* testimony of *Andrew S. Hallidie, Peter H. Jackson, and the complainant Root.*

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*Andrew S. Hallidie's* testimony is found from pages 28 to 36 of Record. He is interested in the outcome of this suit, being a stockholder in the Pacific Cable Co., which controls the patent in suit for the Pacific Coast (p. 36, Record).

Mr. Hallidie is a civil and mechanical engineer, and constructed the Clay street cable road, which has been before referred to.

He states that in his opinion, to test the practicability and general practical character of a cable road, built according to the patent in suit, would require a use of from five to seven years (p. 29, Record).

In testimony which he had previously given in the interference between Root and Eppelsheimer he had stated it would require "two or three years' actual use, or even longer," to decide as to the practical character of Root's device (p. 34, Record).

In spite of these opinions, however, he put down a similar construction on the extension of the Clay street road without waiting for this test.

His testimony is the mere expert opinion of an interested party.

*Peter H. Jackson's* testimony is given from pages 25 to 27, Record.

His opinion is principally claimed to be based on his knowledge and experience for the past eight years in experiments with the application of iron and concrete, which resulted in patents relating to subjects in which concrete was used, such as artificial stone sidewalks to cover vaults and other matters of like character.

He enters into an elaborate quasi-scientific discussion as to the Root construction in order to state that, in his opinion, it would require long years of study and practical experiment, not to determine whether the Root construction would be practical, but as to its lasting qualities.

When, however, the test question is put to him as to what would be a reasonable time to arrive at a positive conclusion as to whether the Root construction would

be suitable for its purpose, this is the best he can say for his client:

"I have given this question—revolved it in my own "mind—considerable consideration during my exami- "nation of the Root Patent, and I have concluded that "I could answer best in this wise:

"If I or any of my friends were about to take a pe- "cuniary interest at the inception of the building of "the road, I would not of myself, nor would I advise my "friends, to take my interest until it had been in prac- "tical operation for four years. Further, the aggre- "gate of these destructive forces which I have hereto- "fore stated are so slow that a great length of time "must elapse as to the time of its practical working."

This opinion of Mr. Jackson is an attempted answer to the opinion of Mr. John Bogart, the State engineer of the State of New York, and for some time previous the deputy State engineer. Mr. Bogart gives his ample qualifications to express his opinion on this subject at pages 178, 179, Record, in which he shows that he has practical experience in the use of concrete in all sorts of uses.

He thus states his opinion as to the time necessary to form an opinion as to the practicability of the Root construction:

"An important element in the determination as to "the value of such a conduit is the condition and char- "acter which the concrete would have. The time taken "by the concrete to acquire great solidity varies some- "what with the character of the cement used in its con- "struction, some being quick-setting and some slow. "The slow-setting cements acquire a very large propor- "tion of their ultimate strength within the period of "one month. I consider that within the period of six "months, at the longest, a positive conclusion could "be arrived at as to whether the structure referred "to would or would not be suitable for the purpose "for which it was constructed. While it is probably "true that cement, and the mortar made with cement,

" continues to increase slightly in hardness for " an indefinite number of years, yet extended experi- " ments and observations show that they acquire quite " nearly their ultimate strength within a period ranging " from one month to six months. The knowledge of " the action of concrete and of the time taken by it to " become strong has been possessed by civil engineers " for many years, and unless, in a particular case, there " were some peculiar and unprecedented stress to which " the concrete would be liable, I think a reliable judg- " ment could be formed by an experienced engineer as " to the probable durability and effectiveness of con- " crete in a given position."

The cross-examination to which Mr. Bogart is subjected only confirms this opinion.

The difference in weight between these two opinions (Bogart's and Jackson's) is most marked, the one confining himself to the length of time necessary to determine whether the construction is practical and suitable for its purpose; the other referring only to the length of time, in his opinion, necessary for a capitalist to determine whether it was wise to invest his money in the road in which the construction is used. But even this test fails, for no extended experiment was necessary to induce Governor Stanford, who at the time controlled the road, owning nine-tenths of the stock, to expend $418,000 in the construction and necessary equipment.

The only remaining testimony as to claimed experimental use is that of the complainant Root.

We have already seen that the only excuse he can give for his delay in applying for his patent was that he did not want a patent if the structure was weak or undesirable, but he produces no satisfactory evidence to show that he ever supposed that it would turn out to be a structure of such character.

He says that Crocker, Hallidie and Britton, who were interested in the road, expressed doubts as to the durability of the structure, and these doubts weighed somewhat with him, but he still confesses that he then

believed that there was more than an even chance of the structure proving to be durable and desirable (fol. 78, Record).

He, however, never appears to have expressed these doubts to any one, and it is to be observed that neither he nor any one else expressed any such doubt after July, 1877, when the building of the road was commenced. The doubts, if any, were all spoken of only when the Root plans were first explained and never after, and never at all by Root. He also states that the only time after the road was constructed that he had any doubt as to the durability of the structure was in the spring of 1879, about a year after the road began to run. In preparing an extension of the road, he says he had occasion to dig out and expose some of the old structure. He says he then saw some indication of the loosening of the yokes in the concrete, and had some little fear at that time that some trouble might arise "in that respect" (fol. 79, Record).

This "little fear" which he said he had at that time never impelled him to expose any other parts of the structure so as to see whether there were any indications of loosening of the yokes in the other parts of the structure at this or any other time, nor did it occur to him to take any measures or precautions to prevent any further loosening in the parts thus exposed. For all that appears in the testimony, he simply covered over the parts of the structure so exposed and never mentioned to any one his fears in the matter. He further endeavors to show that the California street road was an experiment, because he claims that the Market street road, of San Francisco, which was originally a horse-car road, was converted into a cable road with his tunnel construction in 1882, and that this would never have been done unless the California street road had first proved to be a success. That the cost of the California street road was about $400,000, while the cost of the Market street road was almost $2,000,000. That this delay in building the Market street road and the differ-

ence in cost shows that the California street road was regarded only as an experiment, and consequently he was justified in delaying his application for over three years after his construction had gone into public use. (pp. 47, 48 of Record).

This illogical proposition is deprived of all point by the fact that Root admits that as early as the beginning of 1881 that something was done with the track and subway plans of the Market street road, and that some work was done on the terminal arrangements of the road and engine house about 1880 (pp. 47, 54, 55 of Record).

He further admits that in the first half of 1881 he saw Holmes, of the Chicago City Cable Road, and recommended his tunnel construction (p. 55 of Record).

If his construction was at that time, early in 1881, such a success that he could recommend it to the Chicago City Railroad and design plans and make all arrangements for converting the Market street road into a cable road with his subway construction, surely its practicability had been demonstrated sufficiently to authorize him to apply for a patent. He, however, did not so apply until about eight months later, September, 1881, and this delay he does not attempt to explain.

It is evident that the California street road, so far from being regarded by himself or others as an experiment, was believed to be a success from the start, and was so treated.

Root either deceived Senator Stanford and the other capitalists who were depending upon his recommendation, as an engineer, that the construction was a good one and would be thoroughly effective, while, as he himself testifies, he had mental reservations as to its durability and efficiency, but that he was foolish enough to express these doubts to the investors and projectors, Gov. Stanford and others, or else he never had these doubts at all, and is attempting to deceive the Court by trumped-up testimony in order to explain his delay in applying for a patent (see Record, pp. 17, 28, 32, 38, 39, 57).

In either case the appellant has not done equity, and is therefore not entitled to equity. In this connection Judge WALLACE, in deciding this case in the lower Court, says: "He admits that he never expressed these doubts to the projectors, either while discussing with them the features of his invention, or while the road was being built, or while he remained its superintendent and after it was completed."

If he had entertained any serious doubts of its adequacy for the purpose for which it was intended, it would seem that he would not have recommended it in view of the considerable sum it was to cost.

*3d. In the Nicholson case the evidence was complete that Mr. Nicholson never allowed the experimental section of the road to pass from under his control.*

It was put down on a road in which he was interested as a stockholder and treasurer; it was laid at his expense; it was looked after by himself personally; he always kept the title to it; he could have taken it up at any time. As the Court says:

"Nicholson did not sell it or allow others to sell it. "He did not let it go beyond his control. He did "nothing that indicated any intent to do so.

"He kept it under his own eyes, and never for a "moment abandoned the intent to obtain a patent for "it" (99 U. S. Reports, p. 136).

In the present case, Root built the road for a corporation in which he was not a stockholder; it was paid for by others; he received the price for it, parted with all interest and title in it, and it passed absolutely from his control, and he did everything in his power to show that he intended to have it so.

4th. In the Nicholson case the Court says:

"*Any attempt to use for a profit and not by way of "experiment for a longer period than two years before "the application would deprive the inventor of a "patent.*"

In the present case Root not only received his price for building the road, but it was at once used for a

profit, and continued to be so used for three years and five months before he applied for his patent.

From all the foregoing it appears perfectly clear that the invention in controversy was in actual public use for three years and five months before the patent was applied for; that the complainant presents no satisfactory excuse for his delay in applying for the patent, nor does he produce any satisfactory evidence showing an intent not to abandon his invention, nor that its use in public was experimental. On the other hand, the evidence is conclusive that the invention the moment it was put in public use passed from his control and has been used for pay ever since. It is thus seen that complainant does not meet any one of the tests prescribed in the Nicholson pavement case.

It seems to us unnecessary to refer to or discuss in detail the other decisions which relate to public use. In the great majority of these cases there was conflicting evidence as to public use. There is no such conflict here. It is sufficient to say that all recent decisions of the Supreme Court rigorously apply the statute that more than two years' public use before application is fatal to the patent.

The rule laid down in the Nicholson pavement case is well stated in the case of Egbert vs. Lipman (104 U. S., p. 333), as follows:

"If an inventor, having made his device, gives or "sells it to another, to be used by the donee or vendee "without limitation or restriction, or injunction of "secrecy, and it is so used, such use is public within "the meaning of the statute, even though the use and "knowledge of the use may be confined to but one "person."

## POINT III.

**The patent should be declared void for the reason that the invention, even assuming that it was made by Root, was abandoned by him long before he filed his application for patent.**

This point is fully discussed under the head of abandonment, Point II.

## POINT IV.

**The patent should be declared void for the reason that the ideas embodied and claimed in said patent were disclosed to the appellant by another party.**

This is shown in the transcript of interference proceedings (Respt.'s Record Exhibit Book; also at pp. 21, 22, 105, 106, 133, 134.)

## POINT V.

**The appellee should be declared as not having infringed in view of the limitations imposed by the state of the art upon appellant's patent.**